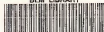


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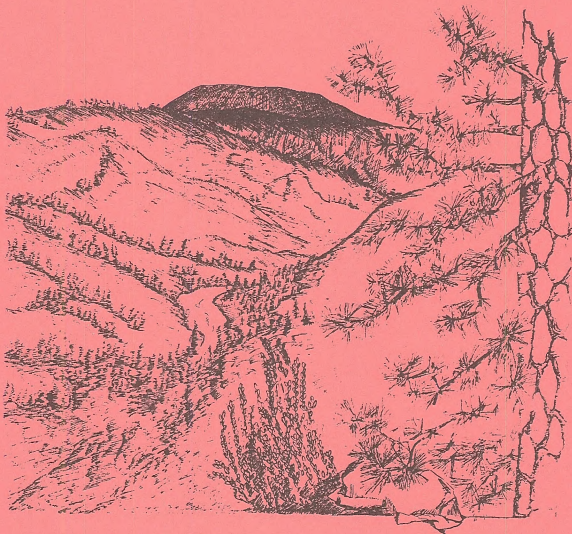
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2795 Anderson Avenue, Bldg. 25  
Klamath Falls, Oregon 97603

September 1994



# Klamath Falls Resource Area Resource Management Plan and Environmental Impact Statement

## Volume II



As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interest of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

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**U.S. Department of the Interior**  
**Bureau of Land Management**

**Proposed Resource Management Plan/  
Final Environmental Impact Statement**

for the

**Klamath Falls Resource Area**

Prepared by

Klamath Falls Resource Area Office  
Lakeview District  
September 1994



Elaine Zielinski  
State Director, Oregon/Washington

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Charles Graham  
District Manager, Lakeview District



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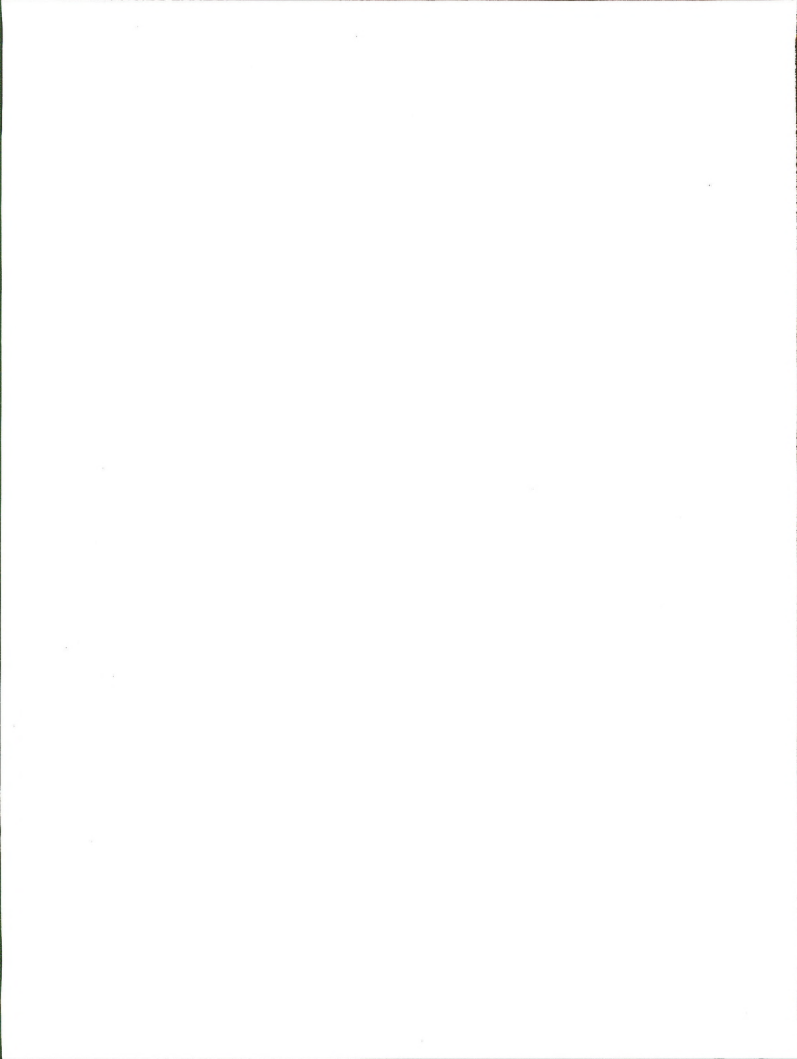
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# Acronyms

ACEC	Area of Critical Environmental Concern
AMS	Analysis of the Management Situation
AMP	Allotment Management Plan
AQMA	Air Quality Management Area
ARD	Automated Resource Data
ASQ	Allowable Sale Quantity
AUM	Animal Unit Month
BLM	Bureau of Land Management
BMP	Best Management Practices
BR	Bureau of Reclamation
BS	Bureau Sensitive (species)
CDWR	Critical Deer Winter Range
CEQ	Council of Environmental Quality
CFR	Code of Federal Regulations
CMAI	Culmination of Mean Annual Increment
CRMP	Coordinated Resource Management Plan
DBH	Diameter at Breast Height
DEIS	Draft Environmental Impact Statement
DEQ	Oregon Department of Environmental Quality
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FC	Federal Candidate (species)
FEIS	Final Environmental Impact Statement
FERC	Federal Energy Regulatory Commission
FLPMA	Federal Land Policy and Management Act
GIS	Geographic Information System
HCA	Habitat Conservation Areas
HMP	Habitat Management Plan
IDT	Interdisciplinary Team
IPM	Integrated Pest Management
ISC	Interagency Scientific Committee
KFRA	Klamath Falls Resource Area
L-S/DDR	Late-Successional/District Designated Reserve
LTSY	Long-Term Sustained Yield
MBF	Thousand Board Feet
MCF	Thousand Cubic Feet
MFP	Management Framework Plan
MMBF	Million Board Feet
MMCF	Million Cubic Feet
MOSS	Map Overlay and Statistical System
MOU	Memorandum of Understanding
MTP	Master Title Plat
NA	No Action (alternative)
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
NWR	National Wildlife Refuge
NWSRA	National Wild and Scenic Rivers Act
OAR	Oregon Administrative Rules
O&C	Oregon and California Act of 1937 (Revested Oregon and California Railroad and Reconveyed Coos Bay Wagon Road Grant Lands)



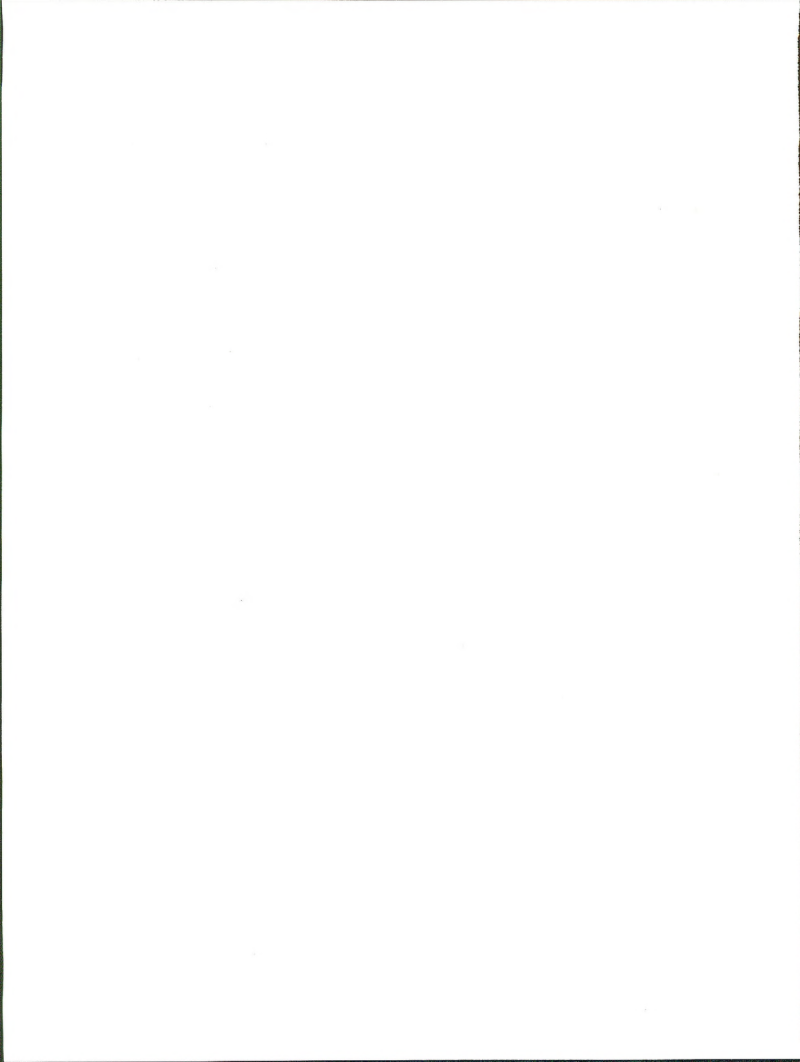
ODF	Oregon Department of Forestry
ODFW	Oregon Department of Fish and Wildlife
OEDD	Oregon Economic Development Department
OFFA	Oregon Forest Practices Act
OHV	Off-Highway Vehicle
OI	Operations Inventory
ONHP	Oregon Natural Heritage Program
ORS	Oregon Revised Statutes
ORV	Outstandingly Remarkable Values (for wild and scenic rivers)
OSMP	Oregon Smoke Management Plan
OSU	Oregon State University
PCNST	Pacific Crest National Scenic Trail
PCT	Pre-Commercial Thinning
PD	Public Domain
PM	Particulate Matter
PL	Public Law
PNC	Potential Natural Communities
PNW	Pacific Northwest Research Station
PSQ	Probable Sale Quantity
R&R	Retention and Restoration (blocks)
RMA	Riparian Management Area
RMP	Resource Management Plan
RNA	Research Natural Area
ROD	Record of Decision
ROS	Recreation Opportunity Spectrum
ROW	Right-of-Way
RTMS	Ten-year Representative Timber Management Scenarios
SC	State Candidate (species)
SCS	Soil Conservation Service
SCORP	Statewide Comprehensive Outdoor Recreation Plan
SIP	State Implementation Plan
SL	State Listed (species)
SYU	Sustained Yield Unit
T&E	Threatened and Endangered (species)
TMDL	Total Maximum Daily Loads
TPCC	Timber Production Capability Classification
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USDA	U.S. Department of Agriculture
USDI	U.S. Department of the Interior
VRM	Visual Resource Management
WODDB	Western Oregon Digital Data Base
WSA	Wilderness Study Area

# Appendix A

## Legal Guidelines

The following statutes and executive orders (as amended) constitute the major legal guidance for planning and management of lands administered by BLM in western Oregon. This list is not necessarily all inclusive but does represent the primary legal guidance to be considered in preparation of the Resource Management Plan.

Animal Damage Control Act of 1931 (March 2), As Amended	7 USC 426-426(b)
Federal Land Policy and Management Act of 1976 (FLPMA)	43 USC 1701
The Oregon and California Sustained Yield Act of 1937	43 USC 1181a
National Environmental Policy Act of 1969 (NEPA)	42 USC 4321
Environmental Quality Improvement Act of 1970	42 USC 4371
Executive Order 11514, Protection and Enhancement of Environmental Quality (1970)	
Taylor Grazing Act	43 USC 315
Recreation and Public Purposes Act	43 USC 869
Unlawful Inclosures or Occupancy Act	43 USC 1061
Mining and Minerals Policy Act of 1970	30 USC 21a
Mining Act of 1872	30 USC 26
Mineral Leasing Act of 1920 (Mineral Lands Leasing Act)	30 USC 181
Materials Act of 1947	30 USC 601
Geothermal Steam Act of 1970	30 USC 1001
Geothermal Energy Act of 1980	30 USC 1501
Antiquities Act of 1906	16 USC 431
Historic Sites, Buildings, and Antiquities Act	16 USC 461
National Historic Preservation Act	16 USC 470
Archaeological Resources Protection Act of 1979	16 USC 470aa
Reservoir Salvage Act of 1960	16 USC 580m-n
Fish and Wildlife Coordination Act	16 USC 661
Bald Eagle Protection Act	16 USC 668
Sikes Act	16 USC 670a
Migratory Bird Treaty Act	16 USC 703
Migratory Bird Conservation Act	16 USC 715
Wilderness Act	16 USC 1131
National Trail Systems Act	16 USC 1241
Wild and Scenic Rivers Act	16 USC 1271
Executive Order 11644, Use of Off-Road Vehicles on the Public Lands (1972)	
Executive Order 11989, Off-Road Vehicles on Public Lands (1977)	
Wild Free-Roaming Horses and Burros Act	16 USC 1331
Coastal Zone Management Act of 1972	16 USC 1451
Endangered Species Act of 1973	16 USC 1531
Soil and Water Resources Conservation Act of 1977	16 USC 2001
Executive Order 11988, Floodplain Management (1977)	
Executive Order 11990, Protection of Wetlands (1977)	
Coastal Barriers Resources Act	16 USC 3501
Land and Water Conservation Fund Act of 1965	16 USC 4601-4
Federal Water Pollution Control Act/Clean Water Act	33 USC 1251
Safe Drinking Water Act	42 USC 300 (f)
American Indian Religious Freedom Act	42 USC 1996
Resource Conservation and Recovery Act of 1976	42 USC 6901
Clean Air Act	42 USC 7401
Comprehensive Environmental Response, Compensation and Liability Act of 1980	42 USC 9601
Emergency Planning and Community Right-to-Know Act of 1986	42 USC 11001





# Appendix B

## Key Sections of the 1993 Record of Decision on Pacific Yew Environmental Impact Statement

The following sections are excerpted verbatim from the Record of Decision for the Pacific Yew Environmental Impact Statement, dated September 1993. The remainder of the Record of Decision is incorporated by reference.

### The Decision

It is our decision to select Alternative B as the Pacific yew harvest strategy for the National Forest System lands and lands administered by the Bureau of Land Management in Washington, Oregon, California, Idaho, and Montana for the next five years (1993-1997). Our selection of Alternative B is based on the analysis in the Final Environmental Impact Statement, consideration of public comments on the Draft Environmental Impact Statement, and a significant reduction in demand for yew from federal lands for taxol production.

Alternative B permits harvest of any part of the Pacific yew for taxol production from timber sale units and where it might otherwise be destroyed. For the purpose of this document, timber sale units are defined as any area within a timber sale which has a silvicultural prescription for a clearcut<sup>1</sup>, shelterwood<sup>1</sup>, or seed tree<sup>1</sup> harvest method. Pacific yew may also be harvested for taxol from other areas where the yew would otherwise be destroyed by such activities as other timber harvesting, road building or other construction, a prescribed fire treatment, or similar activities. Site-specific environmental analyses are required before any yew harvest takes place.

We recognize that other parts of the yew, such as seed or scion material, may be needed for research or propagation purposes. This decision permits non-destructive harvest (where tree or shrub is not killed) of small quantities of such material for these purposes in any area where allowed by forest plans, BLM resource management plans (draft or final), or new agency resource plans.

Under this alternative, 258,000 to 386,000 pounds of dry bark and/or 686,000 to 1,030,000 pounds of dry needles from an estimated 52,000 to 78,000 yew would be available each year for harvest from National Forest System and BLM lands. These estimates are based on the number of yew per acre found in the 1992 Pacific yew inventory and the projected number of acres for timber sales described in forest plans and adjusted according to the Final Environmental Impact Statement for Management for the Northern Spotted Owl in National Forests (for Forest Service) or in draft resource management plans (for BLM). Many other decisions are currently being made that will most likely reduce the number of timber sale acres and therefore reduce the number of available yew trees and pounds of bark and needles. Under Alternative B, the production of yew from federal lands is largely dependent on the timber harvest program.

Alternative B provides for protection of some of the yew remaining after yew harvest; every sale unit would be regenerated to preharvest or prescribed levels. Special genetic reserves would not be established; however, all acres not committed to timber sales as defined above, would function as genetic reservoirs.

In summary, Alternative B emphasizes utilization of Pacific yew where it would otherwise be wasted. Production of yew would be dependent on the Forest Service and BLM timber harvest programs. It affords the highest degree of protection to the yew by virtue of allowing the lowest level of harvest (with the exception of Alternative A).

## Mitigation Measures

The mitigation measures in the Final Environmental Impact Statement were developed using "An Interim Guide to the Conservation and Management of Pacific Yew, as revised April 1993"<sup>2</sup> as well as suggestions from the public. They were designed to protect the yew and the ecosystem. All practical means to avoid or minimize environmental harm from the selected alternative have been adopted. The mitigation measures for Alternative B follow. These apply only to areas where yew is harvested for taxol.

- ◆ If a timber sale is planned in a unique area where the only yew in the drainage is located in the sale area, then mitigation is required to assure the protection of this yew population. The purpose for this would be to protect the genetic importance of this unique population from timber sale unit locations.
  - ◆ Consider including vigorous, undamaged yew trees or shrubs in the green tree reserves whenever possible.
  - ◆ Harvest yew only where practical (that is sufficient number of stems of utilizable size).
  - ◆ Where yew harvest is planned, harvest yew in the sale unit prior to the harvest of other tree species, to the extent that timber harvesters' health and safety will not be jeopardized. Preharvesting may be accomplished by decking yew logs in specific locations within the sale unit during logging operations.
  - ◆ Harvest yew that is not in the residual green tree reserve.
  - ◆ Do not harvest yew for the primary purpose of yew products within 75 feet slope distance from the average high-water level of a perennial stream. Where forest plans, resource management plans, or other plans or prescriptions set wider streamside buffers, these greater buffers will be adhered to.
  - ◆ Site-specific prescriptions will identify logging systems, site preparation and fuels reduction treatments, and conifer regeneration plans with regard to yew survival and regeneration.
  - ◆ Use one or more of the following methods to maintain or replace yew on the site at preharvest levels. Where preharvest yew densities are estimated to be greater than 50 yew plants per acre, then a minimum of 50 yew plants per acre will be prescribed in site-specific prescriptions.
1. Retain and protect as much of the residual yew (stumps, trees, shrubs, advanced regeneration remaining after harvest) as possible and practical from post-harvest activities such as slash piling and burning. Plan logging systems and slash disposal methods which favor the survival of residual yew plants and stumps, for example, grapple piling or combined machine and burning methods or special burn prescriptions. Include retention of yew and yew stumps as one of the prescribed fire objectives in burning plans. Leave litter and down wood in those patches for seedling establishment.
- Protect yew stumps by the following.
- a. To facilitate sprouting, leave yew tree stumps at the scientifically recommended height (currently 12 inches high). Yew shrubs should be cut to leave a similar length from the root collar.
  - b. Leave bark intact on yew stumps.
  - c. Whenever possible and practical, shade yew stumps with slash or adjacent vegetation and position reserve green trees to provide shade for yew stumps and advanced yew regeneration. Shading is not normally necessary on shrub form yew; site-specific analysis may help determine how much shading is needed.
2. Encourage natural regeneration (from seed already present on site) by using any site preparation methods known to favor yew seed germination and establishment. Site-specific prescriptions will provide seed sources and desired site conditions for natural regeneration of yew and protect concentrations of existing yew where feasible, while still meeting other management objectives. Where on-the-ground conditions preclude this, planting of yew will be prescribed.

3. Plant seedlings according to site-specific prescriptions if prescribed regeneration of yew has not been achieved and there is assurance that regeneration by other means is not occurring. Obtain rooted cuttings or seed or seedlings from sources within the local management area. Cuttings could be collected before harvest. Animal protection measures need to be considered where browsing of young yew is predicted. Refer to "An Interim Guide to the Conservation and Management of Pacific Yew," page 27, for transfer of genetic material guidelines.
- ◆ **Monitoring:** Where possible, monitor yew regeneration in conjunction with normal regeneration and other area surveys.
  - ◆ **Endangered Species Act Consultation:** Yew harvest will be conducted in accordance with all conditions, restrictions, and monitoring procedures that are developed during project level Section 7 consultation required by the Endangered Species Act.
  - ◆ **Seasonal Restrictions for Listed Species:** Pacific yew harvest will follow the appropriate seasonal restrictions for the affected listed species indicated during the project level (site-specific) Section 7 consultation required by the Endangered Species Act.
  - ◆ **Utilization of Yew Material:** Follow current Forest Service and BLM policies for utilization of yew wood, bark, and needles. These policies may differ between Forest Service regions or national forests or between BLM districts.
  - ◆ **Transfer of Yew, Administration of Permits, and Theft Prevention:** Follow current Forest Service and BLM policies for transfer of yew, administration of permits, and theft prevention.
  - ◆ **Tribal Treaties:** Comply with all Native American tribal treaties and consult with tribes where yew harvest may impact trust lands.

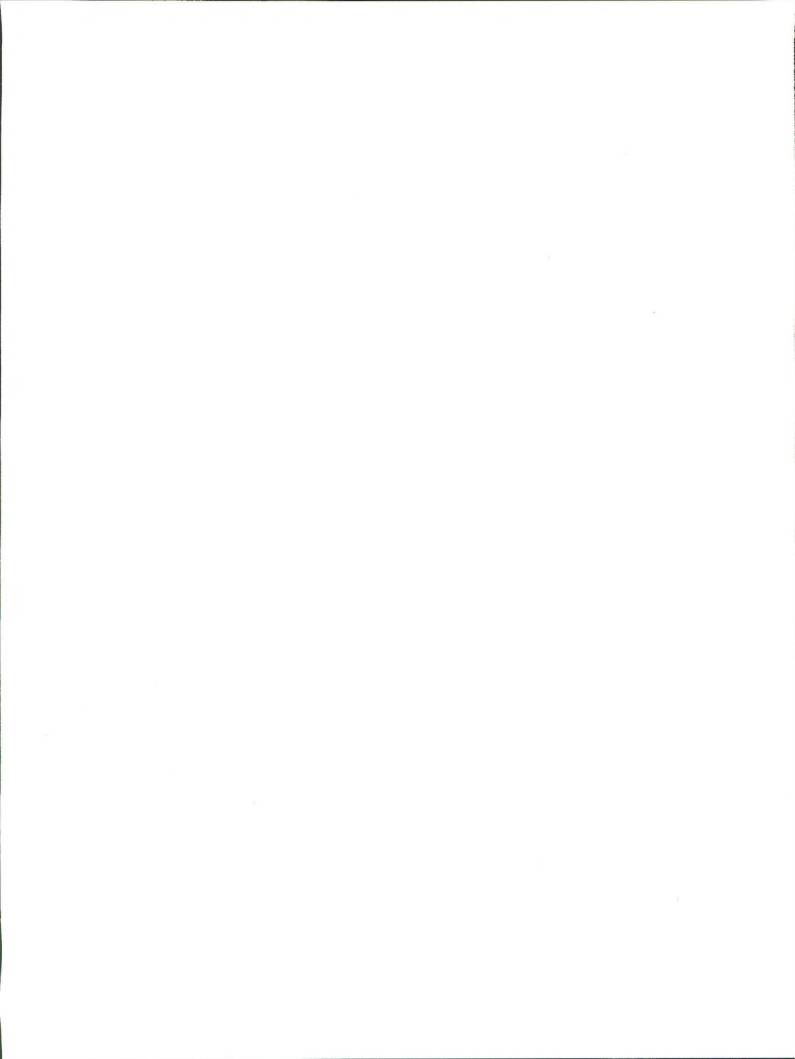
## Monitoring

Monitoring yew harvest, yew survival and regeneration, and protection of other resources will be guided by Forest Service and BLM harvest policies and requirements in forest plans and resource management plans, as well as monitoring identified in site-specific analyses. The Final Environmental Impact Statement requires that yew regeneration be monitored in conjunction with other conifer regeneration surveys (Appendix B-1 in the Final Environmental Impact Statement).

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<sup>1</sup> Harvest method terminology may change. These terms maybe replaced with their equivalents using ecosystem management or other terminology.

<sup>2</sup> U.S. Department of Agriculture, Forest Service, 1992. An Interim Guide to the Conservation and Management of the Pacific Yew. Pacific Northwest Region. 78 p.



# Appendix C

## State Director Guidance for the Resource Management Plan Process

According to Bureau regulations for preparing resource management plans, "the State Director shall provide quality control and supervisory review, including plan approval, for plans and related environmental impact statements and shall provide additional guidance, as necessary, for use by District and Area Managers." "Guidance" means "any type of written communications or instructions that transmits objectives, goals, constraints or any other direction that helps District and Area Managers and staff know how to prepare a specific resource management plan."

Early in the process of concurrently preparing this resource management plan and five other resource management plans which together cover all BLM-administered lands in western Oregon, the BLM State Director decided to develop comprehensive procedural guidance as planning criteria to assure consistent treatment of a variety of issues and concerns in the six plans. The intent to do this was conveyed to known interested parties in a mailer sent out by each BLM district office with planning responsibility on March 27, 1987. Suggestions for content of that guidance were solicited in the mailer.

There was limited public response, but that response, along with internal BLM recommendations, led to formulation of a proposed set of topics for State Director guidance. A mailer describing those topics were sent to the public for comment on August 11, 1987. Using further but still limited public comments, BLM modified its list of topics slightly and drafted Proposed State Director Guidance, which was sent out for public review by interested parties on May 13, 1988.

Although less than a hundred individuals and groups responded, many of the comments received were thoughtful and constructive, and addressed the proposals in depth. The BLM undertook a substantial revision of many sections of the proposed guidance. This revision was done on a staggered schedule, to distribute the workload and provide timely guidance to the districts for each step in the process.

The first element of the guidance completed was Guidance for the Preparation of the Analysis of the Management Situation. This document summarizes important information about existing resource conditions, uses and demands, as well as about management activities and natural relationships. It provides the baseline for subsequent steps in the planning process, such as the design of alternatives and analysis of environmental consequences. The Analysis of the Management Situation also provides most of the data to be summarized in the "affected environment" chapter of the Environmental Impact Statement. The Analysis of the Management Situation guidance prescribed minimum contents and table formats for the Analysis of the Management Situation for each plan. That guidance was essentially completed in October 1988, and slightly revised during 1989 and 1990.

A master glossary for the Analysis of the Management Situation was prepared as part of the State Director Guidance. It was completed in 1989, and later revised for inclusion in each draft resource management plan.

The Guidance for Formulation of Alternatives was essentially completed in October 1990 but underwent modest revision during 1991 and 1992. A copy of the final version of this guidance is included in this appendix.

Two other sections, Guidance for Analytical Techniques Needed to Estimate Effects of Alternatives and Guidance for Use of the Completed Plan, were completed in July 1991, with slight modification of the former in 1992. Descriptions of complex analytical techniques have been appendicized to discussions of the relevant analyses in Chapters 3 and 4. The Use of the Completed Plan section was wrapped into the equivalent section of Chapter 2 of the draft Resource Management Plan/Environmental Impact Statement.

The original draft guidance had two other sections that never became final. Guidance for the Executive Summary was dropped because the State Director's staff prepared that summary. Guidance for expressing consistency with plans, programs and policies of other agencies was never formalized, as BLM staff worked with state agencies and county planners until the draft Resource Management Plan/Environmental Impact Statements were almost complete, on ways to express such consistency.

# **Guidance for Formulation of Alternatives**

## **Introduction**

The purpose of alternatives is to identify a range of reasonable combinations of resource uses and management practices that respond to planning issues and provide management direction for all resources. Five common alternatives will be addressed in each resource management plan, to provide a consistent set of distinct choices among potential management strategies.

A no change from the existing land use plan alternative will also be addressed. This is the "no action" alternative. In the other alternatives all existing land use decisions not found valid for continued implementation after 1990 (through an analysis summarized in the Analysis of the Management Situation), will be reconsidered.

Common alternatives that identify specific management actions along District boundaries will be consistent. Examples include elk management areas, spotted owl corridors, or visual corridors.

This Guidance for Formulation of Alternatives may be modified later based on information identified in the districts' analyses of the management situation, or refinements that flow from the districts' site-specific development of common alternatives.

## **Goals and Objectives of the Common Alternatives**

The purpose of the goal and objective statements for the five common alternatives (A through E) is to guide development of specific criteria. Each alternative, if implemented, is intended to achieve or meet its goal. Goal and objective statements focus on general direction of alternatives rather than technical points in issue-related criteria for the alternatives. In each alternative all resource management values would be accommodated to the extent consistent with the primary goals and objectives for that alternative.

## **Specific Guidance on Common Alternatives**

The common alternatives would differ primarily in the way they allocate primary uses of lands (for example, lands allocated to intensive forest management, and lands allocated to protection of riparian zones).

The discussion on page 4 through part of pages 14 and 15 describes criteria for addressing each of the eleven planning issues in the formulation of the common alternatives. It also describes how land use allocations and management actions would vary in response to each issue. Within the specific constraints provided by the guidance for addressing each issue, the districts have flexibility to formulate the common alternatives as they consider appropriate to meet the goals and objectives of each alternative.



## Klamath Falls Resource Area's Additions

The Klamath Falls Resource Area has both Oregon and California grant lands west of Highway 97 (west side) and large blocks of public domain lands predominantly east of Highway 97 (east side); therefore, there are goals, objectives, and issues that are different from those for the other western Oregon BLM districts. This appendix describes those differences for each alternative, as well as adding two issues that are specific to the Klamath Falls Resource Area — range management and proposed hydroelectric or other alternative energy projects.

The goals and objectives for the five common alternatives have been supplemented to include the livestock grazing (forage) and proposed hydroelectric or other energy projects (other economically important values). This supplemental information is shown in bold print. In addition, references to anadromous fish have been changed to trout because there are no anadromous fish in the resource area.

The additions to the guidance for each issue (shown in bold print) address site-specific resource values that either do not exist or are not a concern for the rest of the western Oregon districts. This includes discussion of native plant communities (specific to the east side), Native American traditional use areas (specific to the resource area), forage utilization in riparian zones (specific to the east side); and the addition of two new issues — range management (mainly an east side issue, but it also affects lands on the west side of the resource area) and proposed hydroelectric or alternative energy projects (specific to the proposed hydroelectric project on the upper Klamath River and the four proposed pumped water storage projects in the resource area).

## Alternative A

## Alternative B

## GOALS:

Emphasize high production of timber, forage, and other economically important values on all lands to contribute to community stability.

## OBJECTIVES:

- Produce the highest sustained yield of timber on all suitable forest lands legally available for harvest.
- Produce the highest sustained yield of livestock on all suitable rangelands legally available for grazing.
- Contribute to ecological functions important to timber and forage productivity and to habitat diversity to the extent possible consistent with the allocation for timber and forage production.
- Manage threatened and endangered species habitat as legally required.
- Provide Research Natural Areas (RNAs) and eligible Areas of Critical Environmental Concern (ACECs) to the extent consistent with the allocation for timber and forage production.
- Manage appropriate Congressionally designated areas to maintain and enhance their scenic values.
- Meet legal requirements for protection of wetlands and water quality, to protect trout habitat and other relevant values.
- Emphasize substantial developed and dispersed motorized recreation uses.
- Find no additional rivers suitable for designation under the Wild and Scenic Rivers Act.
- Make land tenure adjustments which enhance BLM long-term sustained yield timber harvest and forage production opportunities.
- Provide no special management in rural (residential) interface areas.

On lands west of Highway 97, emphasize timber production and other economically important values to contribute to community stability consistent with the variety of other land uses such as fish and wildlife habitat, recreation, and scenic resources on O&C lands. Give equal consideration to all resource values on public domain lands. On lands east of Highway 97, emphasize forage production and other economically important values to contribute to community stability consistent with the variety of other land uses such as fish and wildlife habitat, recreation, and scenic resources.

- Produce a high sustained yield of timber on O&C lands, and on public domain lands where nontimber uses and values are of lesser importance than timber production.
- On lands west of Highway 97, produce a sustained yield of livestock forage consistent with providing forage for wildlife and the Pokegama wild horse herd, and with other uses and values. On lands east of Highway 97, produce high sustained yield of livestock forage consistent with providing for wildlife, and other uses and values.
- Contribute to ecological functions important to timber and forage productivity and to habitat diversity using a system that maintains old growth, mature forest, and other native plant communities in large and small blocks.
- Protect habitat of all threatened and endangered species and species with high potential for listing. Protect habitat of other species of substantial concern, such as critical deer winter range, to the extent consistent with high timber and forage production.
- Retain existing RNAs and ACECs. Provide new RNAs and ACECs from eligible areas to the extent consistent with the emphasis on timber and forage production.
- Manage scenic resources in selected areas of high recreation use.
- Meet legal requirements for protection of wetlands and water quality and provide moderate additional protection for trout habitat, other substantial streams, and other water.
- Provide for a wide range of developed and dispersed motorized recreation uses and opportunities, to minimize conflicts among recreation user groups.
- Find eligible river segments suitable for designation as recreational, if they are important and manageable, and designation would not cause adverse economic impact.
- On lands west of Highway 97, make land tenure adjustments which enhance BLM long-term sustained yield timber harvest opportunities on O&C lands, and which benefit a variety of uses and values on public domain lands. On lands east of Highway 97, make land tenure adjustments which enhance long-term forage production opportunities consistent with a variety of other land uses.
- Adopt appropriate special forest/range management practices on BLM-administered lands intermingled with or adjacent to rural interface areas zoned for most dense residential occupancy.

## Alternative C

Provide timber and forage production and other economically important values to contribute to community stability consistent with maintenance of biological diversity and the variety of other uses such as fish and wildlife habitat, recreation, and scenic resources on all lands.

- Produce a moderate sustained yield of timber.
- Produce a moderate sustained yield of forage for livestock, wildlife, and the Pokagama wild horse herd consistent with allocations for other uses and values.
- Provide biological diversity using a system that maintains some old growth and mature forest, and native plant ecosystems; focusing on protection of areas where special status plant and animal species cluster.
- Protect habitat of all threatened and endangered species and species with high potential for listing. Protect habitat of other species of substantial concern through emphasis on biological diversity and to the extent consistent with moderate timber and forage production.
- Retain existing RNAs and ACECs. Provide new ones from eligible areas except where lands managed by others are considered to provide more appropriate opportunities.
- Manage scenic resources in selected high use areas, particularly emphasizing protection in corridors of existing and proposed wild and scenic rivers and major trails.
- Provide substantial protection wetlands and riparian habitats, including trout habitat, along selected streams and other water environments.
- Provide for a wide range of recreation opportunities emphasizing dispersed use, while reducing conflicts among recreational user groups.
- Find eligible river segments suitable for designation as scenic or recreational, if they are important and manageable, but not suitable for designation as scenic if designation would cause adverse economic impact.
- Make land tenure adjustments to benefit a variety of values and uses.
- Adopt appropriate special forest/range management practices in rural interface areas zoned for moderate or high density residential occupancy.

## Alternative D

Emphasize protection and reestablishment of spotted owl habitat and riparian ecosystem, along with management and enhancement of other values such as dispersed nonmotorized recreation opportunities and scenic resources, while sustaining some timber and forage production.

- Produce a sustained yield of timber consistent with allocations for other uses and values.
- Produce a sustained yield of livestock forage while providing a high amount of forage to wildlife and the Pokagama wild horse herd.
- Protect habitat of the spotted owl in accordance with the Owl Conservation Strategy.
- Protect habitat of all threatened and endangered species, species with high potential for listing, and species of related concern.
- Retain all existing RNAs and ACECs. Provide new ones from eligible areas except where lands managed by others are considered to provide more appropriate opportunities.
- Manage all identified scenic resources.
- Provide substantial protection for wetlands and riparian zones through changes in timber management and livestock grazing and/or exclusion of animals from these areas along most streams and other water environments.
- Emphasize dispersed nonmotorized recreation opportunities.
- Find eligible river segments suitable for designation as wild, scenic or recreational, if they are important and manageable.
- Make land tenure adjustments which would emphasize enhancement of values and uses other than timber and forage.
- Adopt special timber harvest, forest, and range management practices in rural interface areas zoned for moderate or high density residential occupancy.

## Alternative E

Emphasize protection of older forests and native plant communities; and management and enhancement of values such as dispersed nonmotorized recreation opportunities and scenic resources.

- Produce a sustained yield of timber consistent with allocations for other uses and values.
- Produce a sustained yield of livestock forage while providing the highest amount to wildlife and the Pokagama wild horse herd.
- Protect all old growth and older mature forests and other important native plant communities.
- Protect habitat of all threatened and endangered species, species with high potential for listing and species of related concern.
- Retain all existing RNAs and ACECs and designate all eligible areas.
- Manage all identified scenic resources and provide some visual resource protection for all lands.
- Manage all riparian zones and wetlands to maintain and improve water quality and fisheries habitat, and contribute to wildlife habitat diversity through protection of riparian native plant communities.
- Emphasize dispersed nonmotorized outdoor recreation opportunities.
- Find all eligible river segments suitable for designation as wild, scenic or recreational rivers.
- Make land tenure adjustments which would emphasize enhancement of values and uses other than timber and forage.
- Adopt special timber harvest, forest, and range management practices extensively buffering rural interface areas zoned for moderate or high density residential occupancy and other rural interface areas as appropriate.

All Common Alternatives

Alternative A

**Issue No. 1: Timber Production Practices:** Which forest lands should be available for timber management, and what practices should be used on those lands?

Guidance for All Common Alternatives: Lands allocated to intensive forest management under any of these alternatives would normally provide the highest nondeclining harvest level (even flow) of timber when the following conditions prevail:

- Effective silvicultural techniques (such as clear cutting, shelterwood or partial cutting) appropriate to the land allocations are used.
- All feasible site preparation and intensive management practices are applied.
- Anticipated merchantability is the only constraint on minimum average stand diameter slated for future harvest.
- Adequate budgets are available to support the resultant timber sale program and allied intensive management practices, as well as scheduled monitoring linked to those activities.

The common alternatives assume these practices and conditions on the lands allocated to intensive timber management, but incorporate less intensive management practices on other available forest lands to the extent needed to be consistent with the allocation of those lands.

Where consistent with the goals and objectives of each alternative, the following silvicultural and harvest practices would be implemented on lands allocated primarily to timber management, to meet multiple land use objectives:

Minimize regeneration delay by reforesting harvested sites as soon as practical. Calculate an empirical regeneration period based on representative stocking survey results, expected timber sale contract lengths and management objectives.

Reforest harvested lands with indigenous commercial tree species. Emphasis would be placed on utilization of genetically improved stock, where available, in accordance with the Western Oregon Tree Improvement plan.

Use available site preparation and seedling protection practices, including herbicides, using an integrated vegetation management approach. Emphasize those techniques that have proved most effective in assuring seedling survival and growth. (Actual practices will be based on site-specific analysis following completion of the RMP.)

Convert to conifers those lands classified as commercial forest lands presently occupied by grass, hardwoods and brush.

Allocate all forest lands for timber production consistent with the management direction for other resources (Issue Nos. 2 and 3, etc.) In this alternative, except the following:

Nonsuitable Woodland (See Figure C-1 for Chart showing TPCC categories.)

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**Alternative B****Alternative C****Alternative D****Alternative E**

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Allocate all forest lands for timber production consistent with the management direction for other resources in this alternative, except the following:

Nonsuitable Woodland  
Suitable Woodland - Low Site

Allocate all forest lands for timber production consistent with the management direction for other resources, except the following:

Nonsuitable Woodland  
Suitable Woodland - Low Site  
Suitable Woodland - Nonsuitable  
Commercial Forest Land

Allocate all forest lands for timber production consistent with the management direction for other resources, except the following:

Nonsuitable Woodland  
Suitable Woodland - All Categories

Allocate all forest lands for timber production consistent with the management direction for other resources, except the following:

Nonsuitable Woodland  
Suitable Woodland - All Categories  
The Fragile Gradient-Restricted  
component of the Fragile  
Suitable TPCC category  
Site Class V

All Common Alternatives

Alternative A

Issue No. 1 (Continued)

Plant hardwood and juniper woodland sites for management of a sustained yield of forest products, where consistent with allocations for other uses or values.

Implement commercial thinning of present and future stands where practical and where research indicates increased gains in timber production are likely.

Practice initial spacing control of seedlings/saplings through planting or thinning in conjunction with the control of competing vegetation, to maximize wood production by concentrating site resources in individual tree growth.

Plan nitrogen fertilization applications for all present and future stands where research indicates increased wood yields would result.

Plant specific root disease centers with resistant tree species, where appropriate.

Consider uneven-age management in stands where this method would be economically feasible and would maintain environmental values.

Consider efficiency of field operations and assurance of prompt reforestation in selecting the size of timber harvest units.

Apply proper soil management measures to maintain or enhance soil productivity.

Issue Nos. 2 and 3: Old Growth Forests and Habitat Diversity

To what extent and where should old growth and/or mature forest habitats be retained, maintained or reestablished to meet various resource objectives? To what extent and where should BLM manage habitat to support populations of native wildlife species?

Any wildlife habitat management practice (such as nest boxes, road closures and forage seeding) not listed in the following could be implemented under any of the alternatives, as long as it is compatible with other management objectives. All special habitat features would be managed to protect their values. Mature and old growth forests would be retained where Congressional designation of areas requires it. Snags and/or wildlife trees (to be converted to snags) would be retained where they occur on lands not allocated to timber harvest, except where public safety is a concern, and if left standing as nonmerchantable material on available forest lands. Where it would contribute to meeting wildlife tree objectives, create snags in areas not allocated primarily to timber production. A habitat goal of timber sale contracts would be to leave all snags and mature nonmerchantable trees that can be left consistent with safety considerations.

Mature and old growth forests, and other native communities would be retained on most lands excluded from planned timber harvest by inclusion in the following allocations and TPCC categories:

Nonsuitable Woodland  
Riparian Management Areas  
Existing high-use recreation sites  
T&E species recovery areas where timber harvest is prohibited  
Wilderness Areas

Contribute to habitat diversity using a system that protects mature and old growth forest, and native plant communities in large and small blocks. Mature and old growth components of the forest would be distributed in a corridor system by seed zone and elevation. In the corridor system large blocks of approximately 640 acres would be connected by a series of small, stepping stone blocks of approximately 80 acres, spaced at about one-mile intervals. Blocks would be limited to defined corridor areas.

Public Domain lands west of highway 97 and the following allocations and TPCC categories resource area wide would receive priority for placement into the system, to the extent that they fit; for instance, if they provide needed habitat and are suitably located to contribute to the system.

NonSuitable Woodland  
Suitable Woodland - Low Site  
Riparian Management Areas  
Recreation Sites  
T&E species recovery areas where  
timber harvest is prohibited  
Special Areas (Natural Areas,  
ACECs)  
Wilderness Areas

This alternative would provide for retention and improvement of biological diversity. Blocks of forest land at least 600 acres in size and, where relevant opportunities exist, at least 2500 acres in size (including cornering tracts) would be identified as old-growth restoration and retention areas, totalling 15 to 20 percent of BLM-administered forest land. Identification of these areas would focus on protection of older forest stands, connectivity between larger reserves and subregions, and protection of identified areas where special status plant and animal species cluster.

The remaining BLM-administered forest lands, not excluded from timber harvest to address other issues, would be subject to intermediate harvests for density management where feasible, to maintain open canopy conditions and promote retention of mixed species, as well as accelerate development of old growth structure conditions and prepare the stands for regeneration harvest

This alternative would manage habitats on BLM-administered lands to provide for a number and distribution of spotted owls that ensures continued existence of a well distributed population on those lands, so they may interact with spotted owls throughout the geographic range of the species, as recommended by the Conservation Strategy for the Northern Spotted Owl.

Suitable wildlife trees would be retained to contribute to the maintenance or attainment of cavity-dweller populations on BLM-administered lands at 60 percent of the optimum woodpecker population level. Wildlife tree and down log management practices would be used on the available forest lands, including but not limited to retention of green culls, snags and down logs. All special habitat features would be appropriately buffered.

Protect native plant communities, which will provide habitat for diversity of native wildlife species.

This alternative would preserve the following:

- all existing forest stands over 150 years old.
- additional lands within 400 feet of the above stands, to assist in maintaining natural ecological elements, protect the older stands from edge effect and natural disaster, and interconnect them into a sustainable network.
- all suitable habitat forest stands which most closely match the lands within two miles of each spotted owl site occupied by a single or pair of owls in the last six years (1985-1990). In addition protect younger forest where needed to provide contiguous habitat within a mile of those sites.
- in each section where BLM administers at least half of the land, a 40-acre block of the oldest stands remaining, concentrated around headwaters streams, to provide habitat for amphibians and nesting for pileated woodpeckers.



All Common Alternatives

Alternative A

Issue Nos. 2 and 3 (Continued)

**Issue No. 4: Threatened and Endangered  
(and Other Special Status) Species Habitat**

What should BLM do to manage Federally listed threatened or endangered plants and animals and to prevent future Federal listing of plants and animals as threatened or endangered species?

Protect, monitor and manage habitats of Federal listed and proposed species in accordance with the Endangered Species Act and recovery plans, as legally required for self-sustaining survival.

Timber production constraints would be assumed in the formulation of the alternative only if critical habitat has been designated or there is a recovery or conservation plan within a month after completion of the Analysis of the Management Situation. Manage for the conservation of, and mitigate actions to protect habitats of, Federal Candidate, State Listed and Bureau Sensitive species where such actions would not diminish commercial use such as timber production.

**Issue No. 5: Special Areas**

What areas on BLM-administered lands need special management to prevent irreparable damage to important historic, cultural or scenic values; to protect Native American traditional use areas; to protect botanical or fish and wildlife resources or other natural systems or processes; and to protect life and safety from natural hazards? Which of these areas should be formally designated as ACECs?

Any areas considered appropriate for Research Natural Area (RNA) designation would also be considered appropriate for ACEC designation.

Designate potential ACECs that meet criteria only if the relevant values are not protected by other authorities (for example, Wild River designation, the Endangered Species Act). Existing ACECs and potential ACECs that meet the preceding standard, including RNAs and proposed RNAs, would be retained or designated on nonforest lands or nonconsultable woodlands of no substantial mineral potential. Other existing ACECs and RNAs would be revoked. Protect other special areas which do not meet ACEC criteria (such as cultural resource sites, Native American traditional use areas, and native plant communities) to the minimum required by federal law.

## Alternative B

## Alternative C

## Alternative D

## Alternative E

Suitable wildlife trees and/or snags would be retained to maintain, where possible, cavity-dweller populations at 40 percent of the optimum woodpecker population levels in new timber harvest units. Wildlife tree management practices would be used on the available forest lands, including retention only of mature green culls and snags.

Maintain a variety of existing native plant communities, which also provide habitat for a diversity of native wildlife species.

Regeneration harvests on these lands would be either heavy partial cuts (green-tree retention) or group selection cuts, and would not occur until after a stand had established old growth characteristics.

The lands in old growth restoration and retention areas, which have not attained old-growth characteristics, would be subject to similar density management, where feasible, until they attain such a condition.

Suitable wildlife trees would be retained to contribute to the maintenance or attainment of cavity-dweller populations on BLM administered lands at 60 percent of the optimum woodpecker population level. Wildlife tree and down log management practices would be used on the available forest lands, including but not limited to retention of mature green culls, snags and down logs. All special habitat features would be appropriately buffered.

In addition to retention of wildlife trees on lands not allocated to timber management, suitable wildlife trees would be retained to contribute to the maintenance of cavity-nester populations at 60 percent of the maximum potential population level on lands allocated to timber management. Wildlife tree and down log management practices would be used on the available forest lands, including but not limited to retention of green culls, snags and down logs. All special habitats would be appropriately buffered.

Manage vegetation to protect or enhance a wide variety of native plant communities, which will provide habitat to the greatest variety of native wildlife species.

Same as Alternative A, except protect habitats of Federal candidate, State listed and Bureau sensitive species to the full extent on public domain land, and protect habitats of Federal candidate (such as Category 1 and 2) species known only to occur on BLM-administered lands to the extent considered necessary to prevent their federal listing.

Same as Alternative B except for additional protection of special status species provided by criteria for Issues 2 and 3.

Manage all BLM-administered lands to support the conservation and protection of all Federal candidate, State listed, and Bureau sensitive species and their habitats.

Same as Alternative D.

Retain all existing ACECs and RNAs. Designate potential ACECs that meet criteria only if the relevant values are not protected by other authorities. Do not allocate new RNAs on available O&C land if a similar feature can be protected on a national forest. Designate all potential ACECs (including RNAs) on public domain lands, nonforest lands, unsuitable woodlands, and other lands allocated to nontimber uses. Manage other special areas which do not meet ACEC criteria (such as cultural resource sites, Native American traditional use areas, and native plant communities with an emphasis on timber or forage production unless protected by federal law.

Retain all existing ACECs and RNAs. Designate potential ACECs that meet criteria only if the relevant values are not protected by other authorities. Protect other special areas which do not meet ACEC criteria if they have a recognized value for recreational, scientific, Native American traditional use, or other uses.

Retain all existing and designate all potential ACECs. Actively identify and protect other special areas which do not meet ACEC criteria if they have recognized value for recreational, scientific, Native American traditional use, or other uses.

Designate all potential ACECs. Actively identify and protect other special areas which do not meet ACEC criteria. Protect or enhance other special areas for recreational, scientific, Native American traditional use, or other uses.

## All Common Alternatives

## Alternative A

**Issue No. 6: Visual Resources**

Which, if any, areas of BLM lands should be managed to reduce visual impacts or enhance visual (scenic) quality?

Note: Guidance for Issue 11 (Rural Interface Area Management) also addresses and defines visual resource management for Alternatives B, C, D and E in rural interface areas, except where this Issue 6 guidance sets a higher standard of visual resource management. Guidance for Issue 9A (Wild and Scenic Rivers) establishes criteria that will substantially dictate visual resource management by alternative in proposed wild and scenic river corridors. See Issue 9A and Issue 11 guidance for details.

Provide VRM Class I management within existing boundaries designated by Congress for exclusive management. Manage all other available (for timber harvest) forest land under VRM Class IV management objectives. Manage other lands as inventoried.

**Issue Nos. 7 and 8: Stream/Riparian/Water Quality**

Where and how should riparian zones be managed to protect and improve water quality, fisheries and wildlife habitat? What actions should be undertaken to comply with state water quality standards? What should BLM do to manage for special needs such as municipal and domestic use?

Guidance for All Common Alternatives: Establish Riparian Management Areas (RMAs) on perennial and other important streams (generally, 3rd order and larger streams), lakes, ponds and other waters, to meet Oregon Forest Practices Act requirements and Oregon water quality standards. Typical average widths of RMAs by alternative are displayed in Table C-1. Within those RMAs no lands would be considered "available" (to offer timber for sale as part of the allowable sale quantity [ASQ]). Some timber harvest may occur, however, to achieve resource management objectives. These activities may include road construction and yarding corridors across streams and riparian zones to facilitate timber harvest outside the RMA.

Logging, road building and site preparation methods would be designed to minimize the number and/or size of mass soil movements and to maintain the integrity of the RMAs. Other activities such as mining, recreation and OHV use would be regulated to protect water quality. Stream and riparian habitat improvement measures may be taken on any stream to improve water quality, fish habitat, and/or wildlife habitat. Activities would be designed to meet OFPA requirements and Oregon water Quality standards.

Protect wetlands in accordance with Executive Order 11988 and 11990.

Comply with written agreements with public water systems serving municipalities.

Manage forage utilization in riparian zones to meet minimum water quality standards and maximize forage production.

**Issue No. 9: Recreation Resources**

What areas or sites should be designed and/or managed to protect or enhance a variety of recreational opportunities?

Manage for dispersed recreation activities consistent with managed forest settings, including hunting, fishing, sightseeing, riding/hiking, and rafting. Maintain and manage existing recreation facilities which make available significant dispersed recreation opportunities, including recreation sites, boat ramps, trails, interpretive signs and related improvements. Manage existing Special Recreation Management Areas (SRMAs) and delineate Extensive Recreation Management Areas (ERMAs).

Manage existing high-use recreation sites and trails and expand them where needed. Close low use recreation sites and trails. Designate lands open to off-highway vehicles (OHV) and leave roads open to motorized use, except where such designation would conflict with other allocations.

## Alternative B

Provide VRM Class I management within existing boundaries designated by Congress for exclusive management. Manage as inventoried all available forest land adjacent to, within one quarter mile, developed recreation sites, state and federal highways, state scenic waterways, and rivers designated under the Federal Wild and Scenic Rivers Act. Manage all other available forest land under VRM Class IV management objectives. Manage other lands as inventoried.

## Alternative C

Same as Alternative B, except on available forest land where BLM-administered land makes up more than half of a viewshed, manage lands as inventoried.

## Alternative D

Manage all lands as inventoried.

## Alternative E

Same as Alternative D, except manage as VRM Class III all BLM-administered lands inventoried as Class IV; and manage as VRM Class I BLM-administered lands adjacent to, within one quarter mile, developed recreation sites, state and federal highways, state scenic waterways and rivers designated under the Federal Wild and Scenic Rivers Act.

Manage forage utilization in riparian zones to meet minimum water quality standards while maximizing forage production consistent with other uses and values.

Establish set utilization levels within selected riparian habitats while producing a moderate sustained yield of forage.

Protect selected riparian ecosystems by excluding livestock from those areas. Manage all other riparian zones through the use of intensive grazing management, thereby enhancing other values.

Protect or enhance riparian zones to achieve a health and productive ecological condition for maximum long-term multiple-use benefits and values.

Table C-1. Riparian Management Areas

Stream Order	Average RMA Width* (each side of the stream in feet)				
	ALT. A	ALT. B	ALT. C	ALT. D	ALT. E
1					50
2				60	60
3	75	75	105	140	200
4	75	100	150	200	200
5	75	140	210	280	280
6	75	160	240	320	320
Lakes, Ponds & Other Waters	75	100	150	200	400

\* Actual RMA widths would be determined by on-the-ground riparian vegetation, terrain and stream characteristics, but would be a minimum of 50 feet on all 3rd order and larger streams. First and second order streams would have RMAs designated if perennial or if the beneficial uses warrant.

Same as Alternative A, except support the State's Regional Economic Development Plan for the geographic area, retain options for new SRMAs and high value potential recreation sites and trails on public domain lands, maintain and/or improve all existing developed recreation sites, and consider reopening sites closed in recent years.

Allocate and manage new SRMAs. Continue management of all existing recreation sites and trails, and consider reopening sites closed in recent years. Emphasize wildlife viewing, interpretation and related old growth forest recreational opportunities, both to attract nonlocal visitors and to serve local users. Retain options for future development of high value potential sites, trails, and sightseeing opportunities. Impose additional OHV limitations or road closures to protect wildlife habitat or old growth forest recreational opportunities, minimize conflicts with hikers and horseback riders, or meet other resource objectives.

Same as Alternative C, except manage for an optimum range of nonmotorized recreation. Retain options for future development of recreation sites and facilities for dispersed recreational opportunities. Retain existing pockets of old growth forest that are both adjacent to and accessible from existing or potential recreation areas. Prohibit OHV and road use as appropriate to improve wildlife habitat or protect the ecosystem.

Same as Alternative D.

## All Common Alternatives

## Alternative A

### Issue No. 9A: Wild and Scenic Rivers

What, if any, rivers should be found suitable for designation?

Provide interim protection for all river segments determined to be suitable, until Congressional action on BLM plan recommendations. Interim protection should be appropriate to the highest category for which the river is determined to be suitable. Manage Congressionally designated rivers consistent with their designation.

No rivers found suitable for designation under any classification.

### Issue No. 10: Land Tenure

In what areas would BLM-administered lands be sold, exchanged or transferred out of federal ownership under other authorities to improve management efficiency and benefit resource program objectives? In what areas would BLM attempt to acquire lands to improve management efficiency and benefit resource program objectives?

A major lands program effort would use exchanges to consolidate land ownership patterns to benefit one or more of the resources managed, such as timber, range, watershed, wildlife habitat, recreation, cultural, botanical, and minerals.

Land tenure adjustment would be guided by a three-zone concept utilizing the following standards:

Zone 1 includes areas currently identified as having high public resource values, and other efficiently managed lands. The natural resource values may require protection by federal law, Executive Order or policy. These lands may have other values or natural systems which merit long term public ownership. They do not meet the criteria for sale under FLPMA Section 203(a) and would generally be retained in public ownership. The Zone 1 boundaries should be relatively close to or on BLM property lines except where the intent is to show preferred acquisition areas.

Zone 2 includes lands that are suitable for exchange because they form discontinuous ownership patterns, are less efficient to manage than Zone 1 lands, and may not be accessible to the general public. Where appropriate opportunities are identified, these BLM-administered lands may be exchanged for other lands in Zones 1 or 2, transferred to other public agencies, or given some form of cooperative management. These lands would not be expected to meet the criteria for sale under FLPMA Section 203(a), and would not be identified as suitable for such sale.

Zone 3 includes lands that are scattered and isolated with no known unique natural resource values. Zone 3 lands are available for use in exchanges for private inholdings in Zone 1 (high priority) or Zone 2 (moderate priority). They are also potentially suitable for disposal through sale under FLPMA Section 203(a) if important recreation, wildlife, watershed, threatened or endangered species habitat, and/or cultural values are not identified during disposal clearance reviews and no viable exchange

proposals for them can be identified. Exchanges would be made to acquire lands which would enhance the nondeclining harvest level of the commercial forest land managed by BLM, by improving age class distribution or other harvest level determination factors. Exchanges would also be made to enhance long-term forage production. Factors to consider include site quality, access to public forest land, logical logging units, and management of public forest land to facilitate timber harvest. No exchanges would be made to acquire lands more valuable for nontimber/nonforestry uses. No commercial timberland or rangeland would be sold or leased. Leases or conveyance of land in Zones 2 and 3 other than commercial timberland or rangeland would be made under the Recreation and Public Purposes Act to provide appropriate facilities or services.

## Alternative B

## Alternative C

## Alternative D

## Alternative E

No rivers found suitable for designation as wild or scenic. River segments eligible for wild, scenic or recreational classification found suitable for designation as recreational, if all of the following circumstances exist:

- no net adverse economic impacts on the local economy.
- river segment possesses at least one outstandingly remarkable value for which it is considered by BLM to be the top river in the State Comprehensive Outdoor Recreation Plan (SCORP) region.
- BLM can effectively manage the outstanding values of the river segment.

River segments eligible for scenic or recreational river status found suitable for designation consistent with their highest potential classification, and river segments eligible for wild classification found suitable for designation as scenic, if all of the following circumstances exist. If only the economic impact test is not met, find suitable for designation as recreational.

- no net adverse impacts on the local economy.
- river segment possesses at least one outstandingly remarkable value for which it is considered by BLM to be among the top two rivers in the SCORP region.
- BLM can effectively manage the outstanding values of the river segment.

Eligible river segments found suitable for designation consistent with their highest potential classification if the following circumstances exist.

- river segment possesses at least one outstandingly remarkable value for which it is considered by BLM to be among the top four rivers in the SCORP region.
- BLM can effectively manage the outstanding values of the river segment.

All eligible river segments found suitable for designation consistent with their highest potential classification.

Exchanges of O&C lands would be made primarily to acquire lands which would enhance timber management opportunities. Exchanges of public domain lands would be made to benefit one or more of the resources managed, including nontimber values. Sale of O&C lands other than available commercial forest lands, and of public domain lands, would be made to dispose of lands that meet any of the criteria of FLPMA Section 203(a). Leases on such lands would be made to accommodate other uses. Leases or conveyances under the Recreation and Public Purposes Act would be made in Zones 2 and 3 to provide appropriate facilities or services.

Same as Alternative B, except emphasis would also be given to exchanges of O&C lands that would contribute to conservation of biological diversity.

Land exchanges would be made to benefit one or more of the resources managed. Exchanges involving disposal of timber to acquire lands containing greater nontimber values would be emphasized. Sales of lands other than available commercial forest lands would be made to dispose of lands that meet criteria (1) or (2) of FLPMA Section 203(a), but sales of land that meet only criterion (3) would not be made. No lands would be leased, except leases and conveyances under the Recreation and Public Purposes Act would be made in Zones 2 and 3 to provide facilities or services for the benefit of the public.

Same as Alternative D.

All Common Alternatives

Alternative A

Issue No. 10. (Continued).

The discussion of Zone 3 lands must state which of the disposal criteria in FLPMA Section 203(a), apply. Zone 3 lands would also be available for transfer to another agency or to local governments, as needed to accommodate community expansion and other public purposes.

Issue No. 11: Rural Interface Area Management

No special management actions except those that address other issues.

Which BLM-administered lands should be allocated to receive special management practices due to the concerns of residents who live in close proximity? (Rural interface areas are areas where BLM-administered lands are adjacent to or intermingled with privately owned lands where county zoning has created or allows for creation of lots as small as 1 to 20 acres. In most rural interface areas concerns of the residents are related to forest and range management practices, visual quality and potential effects on domestic water sources and water supplies.)

Issue No. 12: Range Management

What should the BLM's grazing management program be? Should the BLM maintain the existing management program, modify it, or provide more intensive management? How should available forage be allocated?

Where consistent with the goals and objective of each alternative, the following range management practices could be implemented on lands allocated to forage production to meet multiple-use objectives:

- remove competing vegetative cover such as juniper, etc. through the use of mechanical methods, prescribed fire, or herbicides to increase forage production
- develop waterspreaders to increase forage production
- construct/develop a variety of range improvement projects
- implement a variety of grazing systems.

Produce the highest sustained yield of livestock forage on all suitable rangelands.

Issue No. 13: Proposed Hydroelectric or Alternative Energy Projects

What actions would the BLM take in response to proposed hydroelectric or alternative energy projects on BLM lands?

Issue rights-of-way for all proposed hydroelectric or alternative energy projects where they do not conflict with timber and forage production.



## Alternative B

## Alternative C

## Alternative D

## Alternative E

On BLM-administered lands within one quarter mile of private lands in identified rural interface areas zoned for 1 to 5-acre lots, customary forest/range management practices would be altered, where realistically feasible, to mitigate the adjacent neighbors' concerns (such as management would look for alternative methods of practicing intensive forest/range management). Examples of management options include harvest regimes other than clearcutting, hand application rather than aerial application of herbicides and pesticides, inclusion of additional buffers for domestic water sources, and hand piling slash for burning as opposed to broadcast burning. All BLM-administered lands within a quarter mile of designated rural interface areas 1 to 5-acre lots) would be managed for VRM class III objectives.

On lands west of Highway 97, produce a sustained yield of livestock forage consistent with providing forage for wildlife and the Pockegama wild horse herd, and with other uses and values. On lands east of Highway 97, produce a high sustained yield of livestock forage consistent with providing forage for wildlife, and with other uses and values.

Issue rights-of-way for all proposed hydroelectric or alternative energy projects consistent with other land uses. On Public Domain lands west of Highway 97 give equal consideration to other resource values.

Same as Alternative B except that lands zoned for 1 to 20-acre lots would also be included as the rural interface area.

Produce a moderate sustained yield of forage for livestock, wildlife, and the Pockegama wild horse herd consistent with other uses and values.

Issue rights-of-way for all proposed hydroelectric or alternative energy projects consistent with the management direction for other resources.

On BLM-administered lands within one quarter mile of private lands in rural interface areas zoned for 1 to 20-acre lots, there would be no herbicide spraying, no clear cutting, and fuel hazards would be reduced with methods other than prescribed burning. BLM-administered lands within this area would be managed for VRM class II objectives.

Produce a sustained yield of livestock forage while providing a high amount of forage to wildlife and the Pockegama wild horse herd.

Issue rights-of-way for all proposed hydroelectric or alternative energy projects consistent with the management direction for other resources.

Same as Alternative D except BLM-administered lands within one half mile of private lands in rural interface areas would be managed as discussed in Alternative D. Areas zoned for lots larger than 20 acres, but with tax lots of 20 acres or less and/or existing legal multiple residences, may also be addressed in this alternative.

Produce a sustained yield of livestock forage while providing the highest amount to wildlife and the Pockegama wild horse herd.

Deny all rights-of-way for proposed hydroelectric or alternative energy projects that conflict with any other resource value.

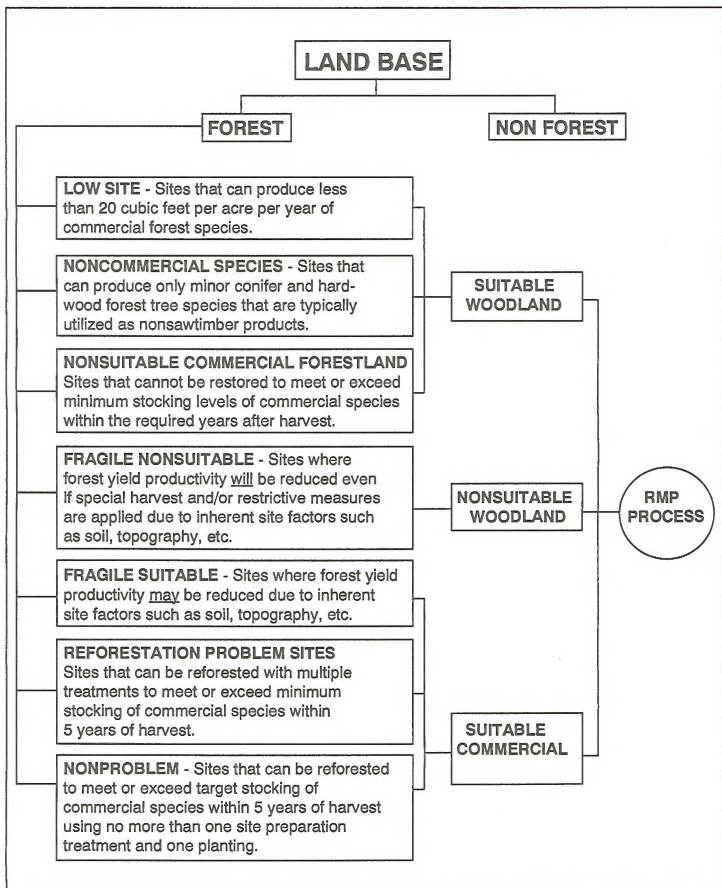


Figure C-1. Timber Production Capability Classification (TPCC) Categories.

## Sensitivity Analyses

Sensitivity analysis is a process of examining specific trade-offs which would result from making changes in single sensitive elements of an alternative. Such analyses are helpful in developing the preferred alternative, to make it most effective in reconciling potential conflicts and optimizing overall benefits. The sensitivity analyses will have the further benefit of informing the public about certain trade-offs, which should facilitate their offering informed preferences in their comments on the draft Resource Management Plan/Environmental Impact Statement.

## Sensitivity Analyses of Land Use Allocations

This analysis will identify approximate opportunity costs associated with differing approaches to the most sensitive land-use allocations and decision elements.

Because of the number of land use allocation issues and alternatives, sensitivity analysis must be tightly focused to be manageable. The analysis, therefore, will focus on mid-range alternatives.

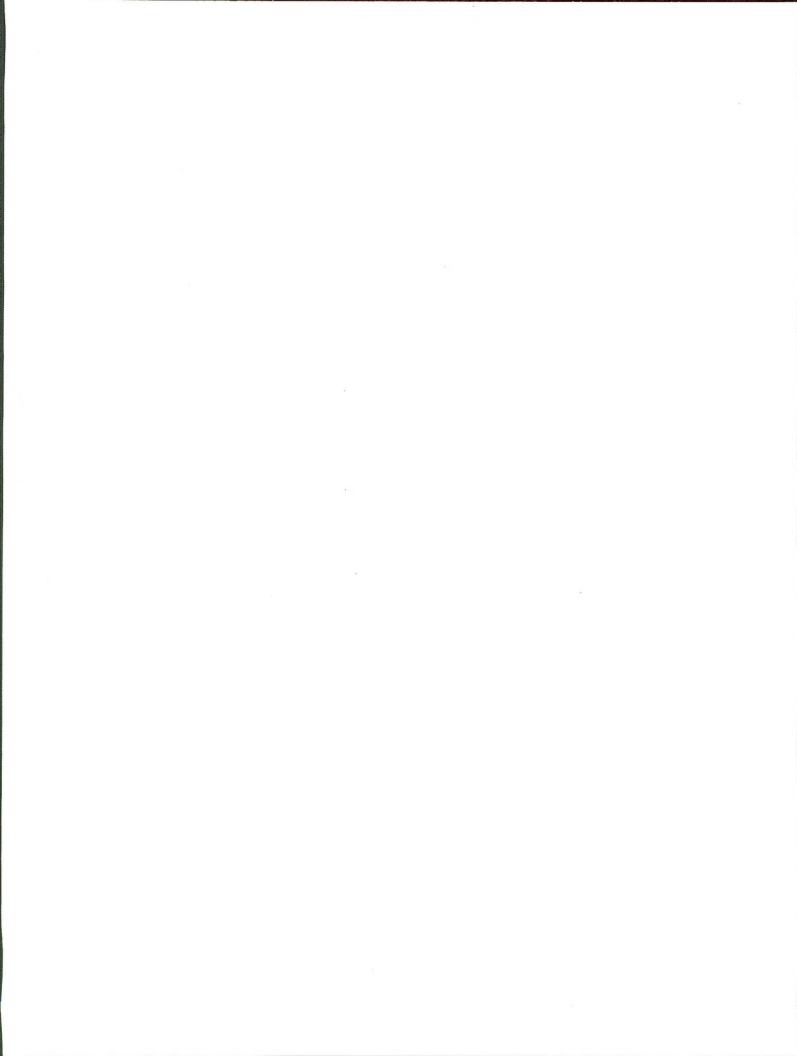
At a minimum, the following will be analyzed for effects on timber harvest and related jobs and county revenues, and on other relevant resources or values:

- For Alternatives B and D, effects of substituting the next higher and next lower alternative levels of snag and wildlife tree protection and of providing no protection on land managed for timber production.
- For Alternatives B, C, and D, effects of substituting the next higher and the next lower alternative levels of riparian zone protection, and of providing only legally required (Alternative A) protection of riparian zones to preserve commercial trees on suitable forest or woodland.
- For Alternative B, the effects of allocating no lands specifically for maintenance of older forest stands; or of managing the lands allocated for such protection on a 250-year or longer rotation, with explicit provision for replacement; or of managing the lands allocated for timber production on a 150-year rotation.
- For Alternatives B and C, the effects of managing all lands allocated for timber production entirely under either of Alternative C's partial retention approaches.
- For Alternative C, the effects of managing the lands allocated for timber production entirely for 15 to 20 percent partial retention, but in the first decades not harvesting in the oldest 20 percent of those lands.
- For Alternatives B and D, the effects of substituting the U.S. Fish and Wildlife Service proposed spotted owl recovery plan for each alternative's older forest or spotted owl protection approach.

## Sensitivity Analysis of Timber Management Prescriptions

In BLM's May 1988 Proposed State Director Guidance a number of sensitivity analyses of preferred alternative timber management prescriptions were proposed. At that time criteria for all common alternatives called for traditional approaches to timber management. The evolution of the common alternatives has changed that, so assumptions about the timber management prescriptions of the Preferred alternative are premature.

Until those prescriptions are identified, it is impossible to ascertain what sensitivity analyses of those prescriptions may be relevant. That question will be revisited by BLM as each district selects its Preferred alternative.



# **Appendix D**

## **Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl**

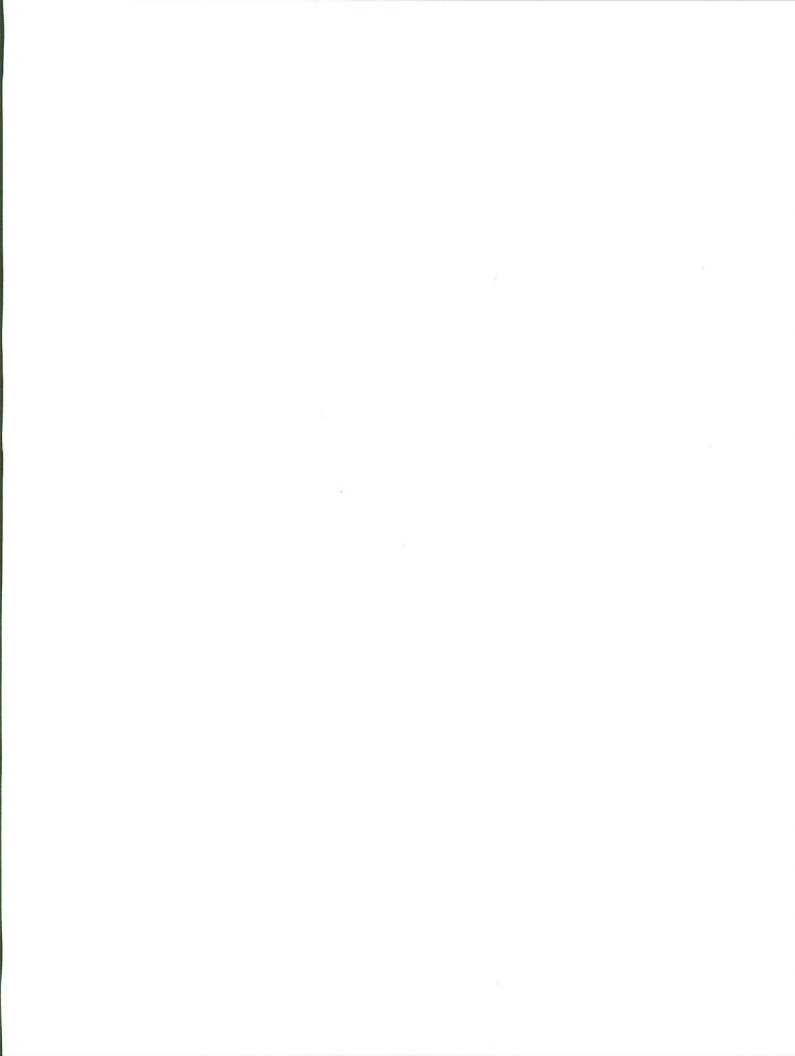
### **Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl**

This appendix consists of the Record of Decision and its Attachment A, published in April 1994, for the Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl. It is referred to in this Proposed Resource Management Plan/Final Environmental Impact Statement as the Supplemental Environmental Impact Statement Record of Decision.

The Supplemental Environmental Impact Statement Record of Decision is bound separately from the Proposed Resource Management Plan/Final Environmental Impact Statement and is incorporated by reference. The Draft and Final Supplemental Environmental Impact Statement and the Supplemental Environmental Impact Statement Record of Decision were sent to those who received copies of the draft Klamath Falls Resource Area Resource Management Plan and Environmental Impact Statement. It was also sent to agencies, libraries, and others who requested it. It is available upon request.

To obtain a copy of the Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl send a request in writing to:

Regional Ecosystem Office  
Post Office Box 3623  
Portland, OR 97208-3623



# Appendix E

## Management for the Supplemental Environmental Impact Statement Special Attention Species

Species	Survey Strategies <sup>1</sup>				Protection Buffers <sup>2</sup>
	1	2	3	4	
<b>Fungi</b>					
<b>Mycorrhizal Fungi</b>					
<b>Boletes</b>					
<i>Gastroboletus subalpinus</i>	X		X		
<i>Gastroboletus turbinatus</i>			X		
<b>Boletes, low elevation</b>					
<i>Boletus piperatus</i>			X		
<i>Tylopilus pseudoscaber</i>	X		X		
<b>Rare Boletes</b>					
<i>Boletus haematinus</i>	X		X		
<i>Boletus pulcherrimus</i>	X		X		
<i>Gastroboletus imbellus</i>	X		X		
<i>Gastroboletus ruber</i>	X		X		
<b>False Truffles</b>					
<i>Nivatogastrium nubigenum</i>	X		X		
<i>Rhizopogon abietis</i>			X		
<i>Rhizopogon atroviolaceus</i>			X		
<i>Rhizopogon truncatus</i>			X		
<i>Thaxterogaster pingue</i>			X		
<b>Uncommon False Truffle</b>					
<i>Macowanites chlorinosmus</i>	X		X		
<b>Rare False Truffles</b>					
<i>Alpova alexsmithii</i>	X		X		
<i>Alpova olivaceotinctus</i>	X		X		
<i>Arcangeliiella crassa</i>	X		X		
<i>Arcangeliiella lactarioides</i>	X		X		
<i>Destuntzia fusca</i>	X		X		
<i>Destuntzia rubra</i>	X		X		
<i>Gautieria magnicellaris</i>	X		X		
<i>Gautieria otthii</i>	X		X		
<i>Leucogaster citrinus</i>	X		X		



Appendix E - Management for the Supplemental Environmental Impact Statement Special Attention Species

Species	Survey Strategies <sup>1</sup>				Protection Buffers <sup>2</sup>
	1	2	3	4	
<b>Rare False Truffles (continued)</b>					
<i>Leucogaster microsporus</i>	X		X		
<i>Macowanites lymanensis</i>	X		X		
<i>Macowanites mollis</i>	X		X		
<i>Martellia fragrans</i>	X		X		
<i>Martellia idahoensis</i>	X		X		
<i>Martellia monticola</i>	X		X		
<i>Octavianina macrospora</i>	X		X		
<i>Octavianina papyracea</i>	X		X		
<i>Rhizopogon brunneiniger</i>	X		X		
<i>Rhizopogon evadens</i> var. <i>subalpinus</i>	X		X		
<i>Rhizopogon exiguus</i>	X		X		
<i>Rhizopogon Flavofibrillosus</i>	X		X		
<i>Rhizopogon inquinatus</i>	X		X		
<i>Seducula pulvinata</i>					
<b>Undescribed Taxa, Rare Truffles &amp; False truffles</b>					
<i>Alpova</i> sp. nov. #Trappe 9730	X		X		
<i>Alpova</i> sp. nov. #Trappe 1966	X		X		
<i>Arcangeliiella</i> sp. nov. #Trappe 12382	X		X		
<i>Arcangeliiella</i> sp. nov. #Trappe 12359	X		X		
<i>Chamonixia pacifica</i> sp. nov. #Trappe 12768	X		X		
<i>Elaphomyces</i> sp. nov. #Trappe 1038	X		X		
<i>Gastroboletus</i> sp. nov. #Trappe 2897	X		X		
<i>Gastroboletus</i> sp. nov. #Trappe 7515	X		X		
<i>Gastrosuillus</i> sp. nov. #Trappe 7516	X		X		
<i>Gastrosuillus</i> sp. nov. #Trappe 9608	X		X		
<i>Gymnomyces</i> sp. nov. #Trappe 4703, 5576	X		X		
<i>Gymnomyces</i> sp. nov. #Trappe 5052	X		X		
<i>Gymnomyces</i> sp. nov. #Trappe 1690, 1706, 1710	X		X		
<i>Gymnomyces</i> sp. nov. #Trappe 7545	X		X		
<i>Hydnotrya</i> sp. nov. #Trappe 787, 792	X		X		
<i>Hydnotrya subnix</i> sp. nov. #Trappe 1861	X		X		
<i>Martellia</i> sp. nov. #Trappe 649	X		X		
<i>Martellia</i> sp. nov. #Trappe 1700	X		X		
<i>Martellia</i> sp. nov. #Trappe 311	X		X		
<i>Martellia</i> sp. nov. #Trappe 5903	X		X		
<i>Octavianina</i> sp. nov. #Trappe 7502	X		X		
<i>Rhizopogon</i> sp. nov. #Trappe 9432	X		X		
<i>Rhizopogon</i> sp. nov. #Trappe 1692	X		X		
<i>Rhizopogon</i> sp. nov. #Trappe 1698	X		X		
<i>Thaxterogaster</i> sp. nov. #Trappe 4867, 6242, 7427, 7962, 8520	X		X		
<i>Tuber</i> sp. nov. #Trappe 2302	X		X		
<i>Tuber</i> sp. nov. #Trappe 12493	X		X		
<b>Rare Truffles</b>					
<i>Balsamla nigra</i>	X		X		
<i>Choiromyces alveolatus</i>	X		X		
<i>Choiromyces venosus</i>	X		X		
<i>Elaphomyces anthracinus</i>	X		X		
<i>Elaphomyces subviscidus</i>	X		X		

Species	Survey Strategies <sup>1</sup>				Protection Buffers <sup>2</sup>
	1	2	3	4	
<b>Chanterelles</b>					
<i>Cantharellus cibarius</i>			X	X	
<i>Cantharellus subalbidus</i>			X	X	
<i>Cantharellus tubaeformis</i>			X	X	
<b>Chanterelles - Gomphus</b>					
<i>Gomphus bonarii</i>			X		
<i>Gomphus clavatus</i>			X		
<i>Gomphus floccosus</i>			X		
<i>Gomphus kauffmanii</i>			X		
<b>Rare Chanterelle</b>					
<i>Cantharellus formosus</i>	X		X		
<i>Polyozellus multiplex</i>	X		X		
<b>Uncommon Coral Fungi</b>					
<i>Ramaria abietina</i>			X		
<i>Ramaria aralospora</i>	X		X		
<i>Ramaria botrylis</i> var. <i>aurantiiramosa</i>	X		X		
<i>Ramaria concolor</i> f. <i>tsugina</i>			X		
<i>Ramaria coulterae</i>			X		
<i>Ramaria fasciculata</i> var. <i>sparsiramosa</i>	X		X		
<i>Ramaria gelatinilaurantia</i>	X		X		
<i>Ramaria lagentii</i>	X		X		
<i>Ramaria rubella</i> var. <i>blanda</i>	X		X		
<i>Ramaria rubrievanescens</i>	X		X		
<i>Ramaria rubripermanens</i>	X		X		
<i>Ramaria suecica</i>			X		
<i>Ramaria thiersii</i>	X		X		
<b>Rare Coral Fungi</b>					
<i>Ramaria amyloidea</i>	X		X		
<i>Ramaria aurantiliccescens</i>	X		X		
<i>Ramaria celerivirescens</i>	X		X		
<i>Ramaria claviramulata</i>	X		X		
<i>Ramaria concolor</i> f. <i>marri</i>	X		X		
<i>Ramaria cyaneigranosa</i>	X		X		
<i>Ramaria hilaris</i> var. <i>olympiana</i>	X		X		
<i>Ramaria loricatissima</i>	X		X		
<i>Ramaria maculatipes</i>	X		X		
<i>Ramaria rainierensis</i>	X		X		
<i>Ramaria rubribrunnescens</i>	X		X		
<i>Ramaria stuntzii</i>	X		X		
<i>Ramaria verlotensis</i>	X		X		
<i>Ramaria gracilis</i>	X		X		
<i>Ramaria spinulosa</i>	X		X		
<b>Phaeocollybia</b>					
<i>Phaeocollybia attenuata</i>			X		
<i>Phaeocollybia californica</i>	X		X		
<i>Phaeocollybia carmanahensis</i>	X		X		
<i>Phaeocollybia dissiliens</i>	X		X		
<i>Phaeocollybia fallax</i>			X		

Species	Survey Strategies <sup>1</sup>				Protection Buffers <sup>2</sup>
	1	2	3	4	
<b>Phaeocollybia (continued)</b>					
<i>Phaeocollybia gregaria</i>	X		X		
<i>Phaeocollybia kauffmanii</i>	X		X		
<i>Phaeocollybia olivacea</i>			X		
<i>Phaeocollybia oregonensis</i>	X		X		
<i>Phaeocollybia piceae</i>	X		X		
<i>Phaeocollybia pseudofestiva</i>			X		
<i>Phaeocollybia scatesiae</i>	X		X		
<i>Phaeocollybia sipel</i>	X		X		
<i>Phaeocollybia spadicea</i>			X		
<b>Uncommon Gilled Mushrooms</b>					
<i>Catathelasma ventricosa</i>			X		
<i>Cortinarius azureus</i>			X		
<i>Cortinarius boulderensis</i>	X		X		
<i>Cortinarius cyanites</i>			X		
<i>Cortinarius magnivelatus</i>	X		X		
<i>Cortinarius olympianus</i>	X		X		
<i>Cortinarius spilomius</i>			X		
<i>Cortinarius tabularis</i>			X		
<i>Cortinarius valgis</i>			X		
<i>Dermocybe humboldtensis</i>	X		X		
<i>Hebeloma olympiana</i>	X		X		
<i>Hygrophorus caeruleus</i>	X		X		
<i>Hygrophorus karstenii</i>			X		
<i>Hygrophorus vernalis</i>	X		X		
<i>Russula mustelina</i>			X		
<b>Rare Gilled Mushrooms</b>					
<i>Chroogomphus loculatus</i>	X		X		
<i>Cortinarius canabarra</i>	X		X		
<i>Cortinarius rainierensis</i>	X		X		
<i>Cortinarius varipes</i>	X		X		
<i>Cortinarius verrucisporus</i>	X		X		
<i>Cortinarius wiebeae</i>	X		X		
<i>Tricholoma venenatum</i>	X		X		
<b>Uncommon Ecto-Polypores</b>					
<i>Albatrellus ellisii</i>			X		
<i>Albatrellus flettii</i>			X		
<i>Polyozellus multiplex</i>			X		X
<b>Rare Ecto-Polypores</b>					
<i>Albatrellus avellaneus</i>	X		X		
<i>Albatrellus caeruleoporus</i>	X		X		
<b>Tooth Fungi</b>					
<i>Hydnum repandum</i>			X		
<i>Hydnum umbilicatum</i>			X		
<i>Phellodon atratum</i>			X		
<i>Sarcodon fuscoindicum</i>			X		
<i>Sarcodon imbricatus</i>			X		

Species	Survey Strategies <sup>1</sup>				Protection Buffers <sup>2</sup>
	1	2	3	4	
<b>Rare Zygomycetes</b>					
<i>Endogone acrogena</i>	X		X		
<i>Endogone oregonensis</i>	X		X		
<i>Glomus radiatum</i>	X		X		
<b>Saprobies (Decomposers)</b>					
<b>Uncommon Gilled Mushrooms</b>					
<i>Baeospora myriadophylla</i>			X		
<i>Chrysomphalina grossula</i>			X		
<i>Collybia bakerensis</i>	X		X		
<i>Fayodia gracilipes (rainierensis)</i>			X		
<i>Gymnopilus punctifolius</i>	X		X		
<i>Marasmius applanatipes</i>	X		X		
<i>Mycena hudsoniana</i>	X		X		
<i>Mycena lilacifolia</i>			X		
<i>Mycena marginella</i>			X		
<i>Mycena monticola</i>	X		X		
<i>Mycena overholtsii</i>	X		X		
<i>Mycena quinaultensis</i>	X		X		
<i>Mycena tenax</i>			X		
<i>Mythicomyces comeipes</i>			X		
<i>Neolentinus kauffmanii</i>	X		X		
<i>Pholiota albivelata</i>	X		X		
<i>Stagnicola perplexa</i>			X		
<b>Rare Gilled Mushrooms</b>					
<i>Clitocybe subditopoda</i>	X		X		
<i>Clitocybe senilis</i>	X		X		
<i>Neolentinus adherens</i>	X		X		
<i>Rhodocybe nitida</i>	X		X		
<i>Rhodocybe speciosa</i>	X		X		
<i>Tricholomopsis fulvescens</i>	X		X		
<b>Noble Polypore (rare and endangered)</b>					
<i>Oxyporus nobilissimus</i>	X	X	X		
<b>Bondarzewia Polypore</b>					
<i>Bondarzewia montana</i>	X	X	X		
<b>Rare Resupinates and Polypores</b>					
<i>Aleurodiscus farlowii</i>	X		X		
<i>Dichostereum granulatum</i>	X		X		
<i>Cudonia monticola</i>			X		
<i>Gyromitra californica</i>			X	X	
<i>Gyromitra esculenta</i>			X	X	
<i>Gyromitra infula</i>			X	X	
<i>Gyromitra melaleucoides</i>			X	X	
<i>Gyromitra montana (syn. G. gigas)</i>			X	X	
<i>Otidea leporina</i>			X		X
<i>Otidea onotica</i>			X		X
<i>Otidea smithii</i>	X		X		X

Species	Survey Strategies <sup>1</sup>				Protection Buffers <sup>2</sup>
	1	2	3	4	
<b>Rare Resupinates and Polypores (continued)</b>					
<i>Plectania melastoma</i>			X		
<i>Podostroma alutaceum</i>			X		
<i>Sarcosoma mexicana</i>			X		X
<i>Sarcosphaera eximia</i>			X		
<i>Spathularia flavida</i>			X		
<b>Rare Cup Fungi</b>					
<i>Aleuria rhenana</i>					X
<i>Bryoglossum gracile</i>					
<i>Gelatinodiscus flavidus</i>	X		X		
<i>Helvella compressa</i>	X		X		
<i>Helvella crassitunicata</i>	X		X		
<i>Helvella elastica</i>	X		X		
<i>Helvella maculata</i>	X		X		
<i>Neomula pouchetii</i>	X		X		
<i>Pithya vulgaris</i>	X		X		
<i>Plectania latahensis</i>	X		X		
<i>Plectania milleri</i>	X		X		
<i>Pseudaleuria quinhaultiana</i>	X		X		
<b>Club Coral Fungi</b>					
<i>Clavariadelphus ligula</i>			X	X	
<i>Clavariadelphus pistillaris</i>			X	X	
<i>Clavariadelphus truncatus</i>			X	X	
<i>Clavariadelphus borealis</i>			X	X	
<i>Clavariadelphus lovejoyae</i>			X	X	
<i>Clavariadelphus sachalinensis</i>			X	X	
<i>Clavariadelphus subfastigiatus</i>			X	X	
<b>Jelly Mushroom</b>					
<i>Phlogotitis helvelloides</i>			X	X	
<b>Branched Coral Fungi</b>					
<i>Clavulina cinerea</i>			X	X	
<i>Clavulina cristata</i>			X	X	
<i>Clavulina ornaticipes</i>			X	X	
<b>Mushroom Lichen</b>					
<i>Phytoconis ericetorum</i>			X	X	
<b>Parasitic Fungi</b>					
<i>Asterophora lycoperdoides</i>			X		
<i>Asterophora parasitica</i>			X		
<i>Collybia racemosa</i>			X		
<i>Cordyceps capitata</i>			X		
<i>Cordyceps ophioglossoides</i>			X		
<i>Hypomyces luteovirens</i>			X		
<b>Cauliflower Mushroom</b>					
<i>Sparassis crispa</i>			X		

Species	Survey Strategies <sup>1</sup>				Protection Buffers <sup>2</sup>
	1	2	3	4	
<b>Moss Dwelling Mushrooms</b>					
<i>Cyphellostereum laeve</i>			X		
<i>Galerina atkinsoniana</i>			X		
<i>Galerina cerina</i>			X		
<i>Galerina heterocystis</i>			X		
<i>Galerina sphagnicola</i>			X		
<i>Galerina vittaeformis</i>			X		
<i>Rickenella setipes</i>			X		
<b>Coral Fungi</b>					
<i>Clavicornora avellanea</i>			X		
<b>Lichens</b>					
<b>Rare Forage Lichen</b>					
<i>Bryoria tortuosa</i>	X		X		
<b>Rare Leafy (arboreal) Lichens</b>					
<i>Hypogymnia duplicata</i>	X	X	X		
<i>Tholurna dissimilis</i>	X		X		
<b>Rare Nitrogen-fixing Lichens</b>					
<i>Dendroscopaulon intricatum</i>	X		X		
<i>Lobaria hallii</i>	X		X		
<i>Lobaria linifolia</i>	X	X	X		
<i>Nephroma occulta</i>	X		X		
<i>Pannaria rubiginosa</i>	X		X		
<i>Pseudocyphellaria rainierensis</i>	X	X	X		
<b>Nitrogen-fixing Lichens</b>					
<i>Lobaria oregana</i>				X	
<i>Lobaria pulmonaria</i>				X	
<i>Lobaria scrobiculata</i>				X	
<i>Nephroma bellum</i>				X	
<i>Nephroma helveticum</i>				X	
<i>Nephroma laevigatum</i>				X	
<i>Nephroma parile</i>				X	
<i>Nephroma resupinatum</i>				X	
<i>Pannaria leucostictoides</i>				X	
<i>Pannaria mediterranea</i>				X	
<i>Pannaria saubinetii</i>				X	
<i>Peltigera collina</i>				X	
<i>Peltigera neckeri</i>				X	
<i>Peltigera pacifica</i>				X	
<i>Pseudocyphellaria anomala</i>				X	
<i>Pseudocyphellaria anthraspis</i>				X	
<i>Pseudocyphellaria crocata</i>				X	
<i>Sticta beauvoisii</i>				X	
<i>Sticta fuliginosa</i>				X	
<i>Sticta limbata</i>				X	

Appendix E - Management for the Supplemental Environmental Impact Statement Special Attention Species

Species	Survey Strategies <sup>1</sup>				Protection Buffers <sup>2</sup>
	1	2	3	4	
<b>Pin Lichens</b>					
<i>Calicium abietinum</i>				X	
<i>Calicium adaequatum</i>				X	
<i>Calicium adspersum</i>				X	
<i>Calicium glaucellum</i>				X	
<i>Calicium viride</i>				X	
<i>Chaenotheca brunneola</i>				X	
<i>Chaenotheca chrysocephala</i>				X	
<i>Chaenotheca ferruginea</i>				X	
<i>Chaenotheca furfuracea</i>				X	
<i>Chaenotheca subroscida</i>				X	
<i>Chaenothecopsis pusilla</i>				X	
<i>Cyphelium inquinans</i>				X	
<i>Microcalicium arenarium</i>				X	
<i>Mycocalicium subtile</i>				X	
<i>Stenocybe clavata</i>				X	
<i>Stenocybe major</i>				X	
<b>Rare Rock Lichens</b>					
<i>Pilophorus nigricaulis</i>	X		X		
<i>Sticta arctica</i>	X		X		
<b>Riparian Lichens</b>					
<i>Cetrelia cetrarioides</i>				X	
<i>Collema nigrescens</i>				X	
<i>Leptogium burnetiae</i> var. <i>hirsutum</i>				X	
<i>Leptogium cyanescens</i>				X	
<i>Leptogium saturninum</i>				X	
<i>Leptogium teretiusculum</i>				X	
<i>Platismatia lacunosa</i>				X	
<i>Ramalina thrausta</i>				X	
<i>Usnea longissima</i>				X	
<b>Aquatic Lichens</b>					
<i>Dermatocarpon luridum</i>	X		X		
<i>Hydrothyria venosa</i>	X		X		
<i>Leptogium rivale</i>	X		X		
<b>Additional Lichen Species</b>					
<i>Cladonia norvegica</i>			X		
<i>Heterodermia sitchensis</i>			X		
<i>Hygomnia vittata</i>			X		
<i>Hypotrachyna revoluta</i>			X		
<i>Ramalina pollinaria</i>			X		
<i>Nephroma isidiosum</i>			X		
<b>Bryophytes</b>					
<i>Antitrichia curtipendula</i>				X	
<i>Bartramioopsis lescurei</i>	X		X		
<i>Brotherella roelli</i>	X		X		X
<i>Diplophyllum albicans</i>	X		X		
<i>Diplophyllum plicatum</i>	X	X			



Species	Survey Strategies <sup>1</sup>				Protection Buffers <sup>2</sup>
	1	2	3	4	
<i>Douinia ovata</i>				X	
<i>Encalypta brevicolla</i> var. <i>crumiana</i>	X		X		
<i>Herbertus aduncus</i>	X		X		
<i>Herbertus sakurai</i>	X		X		
<i>Iwatsukella leucotricha</i>	X		X		
<i>Kurzia makinoana</i>	X	X			
<i>Marsupella emarginata</i> var. <i>aquatica</i>	X	X			
<i>Orthodontium gracile</i>	X		X		
<i>Plagiochila satol</i>	X		X		
<i>Plagiochila semidecurrans</i>	X		X		
<i>Pleuroziopsis ruthenica</i>	X		X		
<i>Ptilidium californicum</i>	X	X			
<i>Racomitrium aquaticum</i>	X		X		
<i>Radula brunnea</i>	X		X		
<i>Scouleria marginata</i>				X	
<i>Tetraphis geniculata</i>	X		X		X
<i>Tritomania exsectiformis</i>	X	X			
<i>Tritomania quinqueidentata</i>	X		X		
<b>Birds</b>					
Great Grey Owl					X
White-headed Woodpecker					X
Black-backed Woodpecker					X
Pygmy Nuthatch					X
Flammulated owl					X
<b>Mammals</b>					
Red tree vole ( <i>P. longicaudus</i> )		X			
Lynx					X
<b>Mollusks</b>					
<i>Cryptomastix devia</i>	X	X			
<i>Cryptomastix hendersoni</i>	X	X			
<i>Helminthoglypta hertleina</i>	X	X			
<i>Helminthoglypta talmadgei</i>	X	X			
<i>Megomphix hemphilli</i>	X	X			
<i>Monadenia chaceana</i>	X	X			
<i>Monadenia churchi</i>	X	X			
<i>Monadenia fidelis minor</i>	X	X			
<i>Monadenia troglodytes troglodytes</i>	X	X			
<i>Monadenia troglodytes wintu</i>	X	X			
<i>Oreohelix n. sp.</i>	X	X			
<i>Pristiloma articum crateris</i>	X	X			
<i>Trilobopsis roperi</i>	X	X			
<i>Trilobopsis tehamana</i>	X	X			
<i>Vertigo n. sp.</i>	X	X			
<i>Vespericola pressleyi</i>	X	X			
<i>Vespericola shasta</i>	X	X			

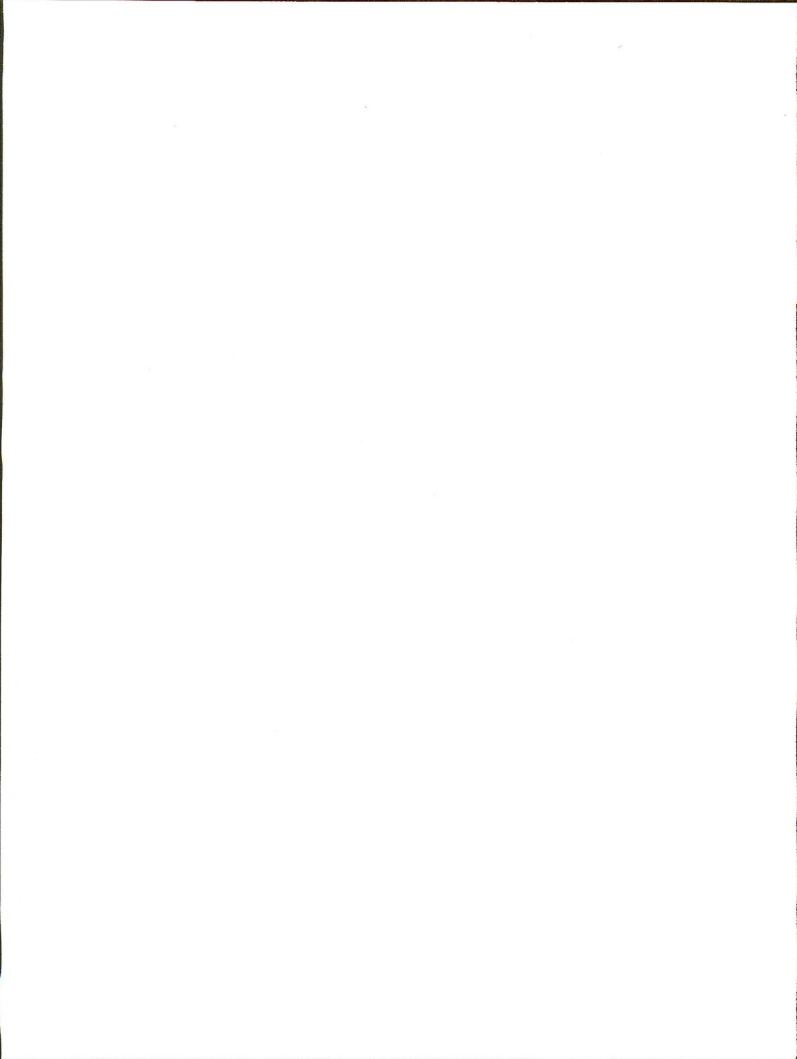
Species	Survey Strategies <sup>1</sup>				Protection Buffers <sup>2</sup>
	1	2	3	4	
<b>Mollusks (continued)</b>					
<i>Deroceras hesperium</i>	X	X			
<i>Hemphillia barringtoni</i>	X	X			
<i>Hemphillia glandulosa</i>	X	X			
<i>Hemphillia malonei</i>	X	X			
<i>Hemphillia pantherina</i>	X	X			
<i>Prophysaon coeruleum</i>	X	X			
<i>Prophysaon dubium</i>	X	X			
<i>Fluminicola n. sp. 1</i>	X	X			
<i>Fluminicola n. sp. 11</i>	X	X			
<i>Fluminicola n. sp. 14</i>	X	X			
<i>Fluminicola n. sp. 15</i>	X	X			
<i>Fluminicola n. sp. 16</i>	X	X			
<i>Fluminicola n. sp. 17</i>	X	X			
<i>Fluminicola n. sp. 18</i>	X	X			
<i>Fluminicola n. sp. 19</i>	X	X			
<i>Fluminicola n. sp. 2</i>	X	X			
<i>Fluminicola n. sp. 20</i>	X	X			
<i>Fluminicola n. sp. 3</i>	X	X			
<i>Fluminicola seminalis</i>	X	X			
<i>Juga (O.) n. sp. 2</i>	X	X			
<i>Juga (O.) n. sp. 3</i>	X	X			
<i>Lyogyrus n. sp. 1</i>	X	X			
<i>Lyogyrus n. sp. 2</i>	X	X			
<i>Lyogyrus n. sp. 3</i>	X	X			
<i>Vorticifex klamathensis sinitsini</i>	X	X			
<i>Vorticifex n. sp. 1</i>	X	X			
<b>Vascular Plants</b>					
<i>Allotropa virgata</i>	X	X			
<i>Arceuthobium tsugense</i>	X	X			
<i>Aster vialis</i>	X	X			
<i>Bensoniella oregana (California)</i>	X	X			
<i>Botrychium minganense</i>	X	X			
<i>Botrychium montanum</i>	X	X			
<i>Corydalis aquae-gelidae</i>	X	X			
<i>Cypripedium fasciculatum (Klamath)</i>	X	X			
<i>Cypripedium montanum (west Cascades)</i>	X	X			
<i>Habenaria orbiculata</i>	X	X			
<i>Pedicularis howellii</i>	X	X			
<b>Arthropods</b>					
Canopy herbivores (south range)					X
Coarse wood chewers (south range)					X
Litter and soil dwelling species (south range)					X
Understory and forest gap herbivores					X

<sup>1</sup> Survey Strategies:

- 1 = Manage known sites;
- 2 = Survey prior to activities and manage sites;
- 3 = Conduct extensive surveys and manage sites; and
- 4 = Conduct general regional surveys.

<sup>2</sup> Protection Buffers are additional standards and guidelines from the Scientific Analysis Team Report for specific rare and locally endemic species, and other specific species in the upland forest matrix (see Record of Decision for SEIS [page C-19]).

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# Appendix F

## Best Management Practices

### Introduction

The best management practices described in this appendix are designed to achieve the objectives of maintaining or improving water quality and soil productivity and the protection of riparian-wetland areas. The goal of the practices listed is to prevent or mitigate adverse impacts while meeting other resource objectives.

These best management practices are a compilation of existing policies and guidelines and commonly employed practices to minimize water quality degradation and loss of soil productivity. These best management practices are considered the primary mechanisms to achieve Oregon water quality standards.

Nonpoint sources of pollution result from natural causes, human actions, and the interactions between natural events and conditions associated with human use of the land and its resources. Nonpoint source pollution is caused by diffuse sources rather than from a discharge at a specific, single location. Such pollution results in alteration of the chemical, physical, and biological integrity of water. Erosion from a harvest unit or surface erosion from a road are some examples of nonpoint sources.

Best management practices are defined as methods, measures or practices selected on the basis of site-specific conditions to ensure that water quality will be maintained at its highest practicable level. Best management practices include, but are not limited to, structural and nonstructural controls, operations, and maintenance procedures. Best management practices can be applied before, during, and after pollution-producing activities to reduce or eliminate the introduction of pollutants into receiving waters (40 Code of Federal Regulations 130.2, Environmental Protection Agency Water Quality Standards Regulation).

Best management practices are identified as part of the National Environmental Policy Act process, with interdisciplinary involvement. Because the control of nonpoint sources of pollution is an ongoing process, continual refinement of best management practices design is necessary. This process can be described in five steps, which are: 1) selection of design of a specific best management practices; 2) application of the best management practices; 3) monitoring; 4) evaluation; and 5) feedback. Data gathered through monitoring is evaluated and is used to identify changes needed in best management practices design, application, or in the monitoring program.

Monitoring of soil, water, and riparian-wetland resources conducted by the Klamath Falls Resource Area is described in the following documents: The Klamath Falls Resource Area Interdisciplinary Rangeland Monitoring Plan; Appendix O in the Klamath Falls Resource Area Proposed Resource Management Plan and Environmental Impact Statement; and BLM Manual Supplement 1743-2, *Rangeland Monitoring Handbook*.

### Use

The goal of this document is to identify water quality and soil objectives for various management actions. The practices listed below each management action are given as examples of best management practices which are effective in achieving the water and soil objectives. Best management practices are selected and implemented as necessary based on site-specific conditions to meet water and soil objectives for specific management actions. This document does not provide an exhaustive list of best management practices. Additional best management practices may be identified during the interdisciplinary process when evaluating site-specific management actions. Implementation and effectiveness of best management practices need to be monitored to determine whether the practices are achieving water and soil objectives. Adjustments will be made as necessary to ensure objectives are met and as needed to conform with changes in Bureau of Land Management policy, direction, or new information.

## Organization

This Appendix is organized by management activities plus separate sections which address activity planning and design, riparian-wetland areas, and fragile soils. Objectives are stated under each management activity followed by a list of practices designed to achieve these objectives.

Any best management practices that corresponds with a Standard and Guideline from the Record of Decision for the Supplemental Environmental Impact Statement has the number of the Standard and Guideline referenced in bold (for example RF-1).

## Legislation and Regulations

This document is designed to ensure compliance with the:

**Clean Water Act of 1972**, as amended (1977 and 1987). Section 319 of the Clean Water Act Amendments of 1987 (Water Quality Act) requires that the states determine those waters that will not meet the goals of the Act, to determine those nonpoint source activities that are contributing pollution, and to develop a process of determining best management practices to reduce such pollution to the "maximum extent practicable".

**Oregon Administrative Rules** (Chapter 340, sections: 340-41-026,027,965). Department of Environmental Quality. Oregon's Administrative Rules contain water quality standards for the identified beneficial uses of water in relation to the antidegradation policy, the requirement for the highest and best control of waste activities, temperature and turbidity.

**BLM Manual 9188: Nonpoint Source Pollution Control**

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# Activity Planning and Design

## A. Planning

**Objective:** *To include soil productivity, water quality and hydrologic considerations in activity planning.*

**Practices:** (1) **Incorporate landscape-level analysis and watershed analysis into project and activity planning.** Watershed analysis consists of: identifying principal issues within a particular watershed; identifying existing and desired conditions (as driven by the principal issues); identifying those processes and activities that need to be modified to achieve the desired watershed conditions; identifying restoration opportunities; and identifying planning and coordination requirements. Guidance on developing watershed restoration projects and for conducting watershed analysis can be found in Chapter 2 of the Proposed Resource Management Plan/Environmental Impact Statement and in other issued guidance.

- (2) Use the timber production capability classification inventory to identify areas classified as fragile due to slope gradient, mass movement potential, surface erosion potential, and high ground water levels.
- (3) Use the planning process to identify, evaluate, and map potential problems (for example, slump prone areas, saturated areas and slide areas).
- (4) Develop activity plans for third to fifth order watersheds to minimize detrimental cumulative effects on water quality and quantity.
- (5) Analyze watershed cumulative effects and provide mitigation measures if necessary to meet water quality requirements (see Cumulative Effects below).
- (6) Disperse activities over time and space.
- (7) Determine potential for natural and activity-created high intensity wildfires at the subwatershed level. Reduce potential for high intensity wildfires through proposed management activities.
- (8) Identify in-stream flows needed to maintain riparian resources, channel conditions, fish passage, and aquatic habitat (LH-1, RA-1).
- (9) Address attainment of Aquatic Conservation Strategy objectives in Wild and Scenic Rivers and Wilderness management plans.

**Objective:** *To restore and maintain riparian-wetland areas so that 75 percent or more are in proper functioning condition by 1997. The overall objective is to achieve an advanced ecological status (late successional), except where resource management objectives, including proper functioning condition, would require an earlier successional stage.*

**Practices:** (1) Assess the current status of a riparian-wetland area in terms of functioning condition and ecological status (see the Definitions and Proper Functioning Condition section for a list of reference materials).

(2) Use the methods outlined in the Definitions and Proper Functioning Condition section and BLM Technical Reference 1737-9, *Process for Assessing Proper Functioning Condition* to determine proper functioning condition and to determine the desired functioning and ecological condition for a riparian-wetland area.



## B. Design

**Objective:** *To ensure that management activities maintain favorable conditions of soil productivity, water flow, water quality, and fish habitat.*

**Practices:** (1) Design proposed management activities to avoid potential adverse impacts to soil and water. Evaluate factors such as soil characteristics, watershed physiography, current watershed and stream channel conditions, proposed roads, skid trails, logging system design, season of activity, etc., to determine impacts of proposed management activities.

(2) Design mitigation measures if unavoidable adverse impacts to water quality/quantity or soil productivity may result from the proposed action.

## C. Maps/Contract Requirements

**Objective:** *To identify areas to be protected and to ensure their protection on the ground.*

**Practices:** Include the following on activity maps and/or contracts:

- (1) Location of all stream channels and riparian-wetland areas (springs, meadows, lakes, bogs, etc.).
- (2) Stipulations required for each stream channel and riparian-wetland area.
- (3) Location of water sources available for Purchaser's/Contractor's use (see the Water Source Development and Use section).
- (4) Location of water sources to be used for management activities (see the Water Source Development and Use section).

## D. Cumulative Effects

**Objective:** *To minimize detrimental impacts on water and soil resources resulting from the cumulative effect of land management activities within a watershed.*

**Practices:** (1) When and where possible, coordinate scheduling of management activities such as timber sales, road construction, and watershed enhancement activities with other landowners in the watershed.

(2) **Identify watersheds with a high level of cumulative effects.** Conduct cumulative effects analysis as required by the National Environmental Policy Act process. Cumulative effects analysis assesses the effects of a proposed action on the environment; the following procedure is only one method of doing so. There is no required standard analysis procedure for cumulative impacts. Cumulative effects analysis is separate, but similar, to analyses conducted for Section 7 Consultation with the U.S. Fish and Wildlife Service. Information in one can be incorporated into the other. Watershed analysis provides information for the "Affected Environment" and "Management Opportunity" portions of a National Environmental Policy Act or planning document, but does not analyze impacts. Cumulative effects analysis supplements and supports watershed analysis.

- a. Use the following general guidelines to delineate watersheds for cumulative effects analyses.
  - 1) Use natural drainage boundaries.
  - 2) Use third to fifth order drainages.
  - 3) Size ranges from 500 to 10,000 acres.
  - 4) Locate lower boundary based on a state-recognized beneficial use.

- b. The extent to which any or all of the following criteria exist would determine which watersheds have a high risk for water quality degradation due to cumulative effects. The criteria are not listed in order of priority.
  - 1) Highly erodible soils.
  - 2) High equivalent clearcut area.
  - 3) Large area of compacted soil.
  - 4) High level of non-recovered openings in transient snow zone.
  - 5) High sedimentation potential.
  - 6) Poor to fair channel stability or condition.
  - 7) Poor to fair riparian condition.
  - 8) High impact from catastrophic event (for example, wildfire).
  - 9) High road density.
  - 10) Potential for adverse impact on a beneficial use.
  - 11) Monitoring data shows that water quality does not meet state water quality standards.
- (3) After initial analysis, an intensive evaluation should include the nature of the problem, the cause of the problem, and a specific plan with objectives and alternatives for recovery and mitigation. Water monitoring may also be initiated to validate the conclusion of the impact analysis and to establish baseline data. This step complements, and may be an integral part of conducting a watershed analysis.
- (4) Based on site-specific conditions, select and apply one or more special management practices such as the following to mitigate water quality impacts in **high risk or highly impacted watersheds**.
  - a. Develop and implement a watershed/riparian enhancement plan and encourage coordination with landowners.
  - b. Require plans of operation for mining and rights-of-way. Require a management plan for grazing.
  - c. Defer the watershed from management activities which would potentially degrade water quality for approximately five years. Reanalyze the watershed.
  - d. Increase widths of Riparian Reserves to provide additional protection.
  - e. Incorporate watershed and riparian-wetland area management objectives into existing plans (Coordinated Resource Management Plans, Allotment Management Plans, etc.) where practicable.
  - f. Require helicopter logging.
  - g. Require full suspension cable yarding.
  - h. Require seasonal restrictions with no waivers for timber falling and yarding.
  - i. Minimize existing and prevent additional road caused impacts:
    - ◆ reduce road densities by obliterating roads or reduce open road densities through road closures
    - ◆ minimize road width and clearing limits
    - ◆ require transport of excavated materials to appropriate disposal site (end hauling)
    - ◆ prohibit new road construction
    - ◆ surface all roads
    - ◆ require seasonal restriction with no waivers for construction, renovation and hauling
    - ◆ require special low impact maintenance and construction techniques
    - ◆ no roadside brushing/grubbing with excavator
    - ◆ no blading and ditch pulling in the wet season unless essential to provide drainage
    - ◆ rock ditch lines
    - ◆ pull back sidecast from road construction and recontour roadway
    - ◆ remove culverts and reshape drainageway crossings
  - j. Restrict or officially close the watershed to off-road vehicle use and enforce the closure.
  - k. Implement regular compliance reviews on all activities in the watershed.
  - l. Assess trade-offs between wildfire suppression impacts and wildfire damage; plan suppression levels accordingly. Limit use of heavy equipment during wildfire suppression (see the Wildfire and Prescribed Fire section).

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- m. Develop a Winter Logging Plan
  - ◆ design proper snow storage areas
  - ◆ manipulate snow cover on roads to allow for proper drainage of melt water
  - ◆ prohibit hauling activities during snow melt

## E. Permits

**Objective:** *To minimize detrimental impacts on water and riparian-wetland resources and to comply with the Clean Water Act.*

**Practice:** Obtain appropriate and necessary permits from the Oregon Department of Environmental Quality (through the Oregon Division of State lands) and the U.S. Army Corps of Engineers for projects potentially affecting waters of the state and/or wetlands. Guidance regarding permit requirements for resource management activities is outlined in BLM Manual 9188: Nonpoint Source Pollution Control and in 33 Code of Federal Regulations 330.

# Riparian Reserves

## Introduction

An *Aquatic Conservation Strategy* is outlined in Chapter 2 of the Proposed Resource Management Plan/Environmental Impact Statement that is aimed at restoring and maintaining the ecological health of watersheds, providing a scientific basis for protecting the aquatic ecosystem, and to enable planning for sustainable resource management.

The objectives of the *Aquatic Conservation Strategy* are:

- ◆ maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations and communities are uniquely adapted;
- ◆ maintain and restore spatial and temporal connectivity within and between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species;
- ◆ maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations;
- ◆ maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain in the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities;
- ◆ maintain and restore the sediment regime under which the aquatic system evolved. Elements of the sediment regime include the timing, volume, rate, and character of sediment input, storage, and transport;
- ◆ maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing. The timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected;
- ◆ maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and wetlands;
- ◆ maintain and restore the species composition and structural diversity of plant communities in riparian-wetland areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability; and

- ◆ maintain and restore habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species.

The components of the Aquatic Conservation Strategy are:

1. **Riparian Reserves:** Riparian Reserves are lands along streams and unstable and potentially unstable areas where special standards and guidelines direct land use. The prescribed widths of these Riparian Reserves for various stream and riparian-wetland area categories are described in Section III A. These widths are intended to provide a high level of fish, wildlife and plant habitat and riparian-wetland area protection until watershed and site analysis can be completed. Although Riparian Reserve boundaries on permanently flowing streams may be adjusted, these are considered to be the approximate widths necessary for attaining Aquatic Conservation Strategy objectives. Post-watershed analysis Riparian Reserve boundaries for permanently flowing streams will approximate the boundaries described in Section III A. Following watershed analysis, Riparian Reserve boundaries for intermittent streams may be different from the existing boundaries. Determination of final boundaries will be based on hydrologic, geomorphic and ecologic processes in a watershed affecting intermittent streams. The widths of Riparian Reserves apply to all watersheds until watershed analysis is completed, a site-specific analysis is conducted and described, and the rationale for final Riparian Reserve boundaries is presented through the appropriate National Environmental Policy Act decision-making process.
2. **Key Watersheds:** Key Watersheds are a system of large refugia comprising watersheds that are crucial to at-risk fish species and stocks and provide high quality water. The Key Watersheds in the Klamath Falls Resource Area are: **Spencer Creek (Tier 1), Clover Creek (Tier 2) and Jenny Creek (Tier 1).**
3. **Watershed Analysis:** Watershed analysis is a set of procedures for conducting an analysis to evaluate geomorphic and ecologic processes operating within a specific watershed. This analysis should enable watershed planning that achieves the Aquatic Conservation Strategy objectives. Watershed analysis provides the basis for monitoring and restoration programs and is the foundation from which Riparian Reserves can be delineated. Guidance for conducting watershed analysis is outlined in various other manuals and documents.
4. **Watershed Restoration:** Watershed Restoration is a comprehensive, long-term program of restoration to restore watershed health and aquatic ecosystems, including the habitats supporting fish and other aquatic and riparian-dependent organisms.

## A. Riparian Reserve Designation

**Objectives:** *To designate an area along streams, lakes, ponds, and other waters for management and protection of riparian-wetland areas and water quality.*

**Practices:** (1) Establish Riparian Reserves on streams and water bodies as listed in the table below. To use this table, a) determine if the stream in a proposed activity area is fish bearing; b) determine if the stream is perennial or intermittent (see the Definitions and Proper Functioning Condition section); c) determine if the area is unstable or potentially unstable (this will be a rare designation in the Klamath Falls Resource Area).

Watershed analysis will identify critical hillslope, riparian, and channel processes that must be evaluated in order to delineate Riparian Reserves that assure protection of riparian and aquatic functions. Project-level consideration of these processes and features will be the basis on which site-specific Riparian Reserves are delineated. The Riparian Reserve widths in Table F-1 apply until watershed analysis is completed, a site-specific analysis is conducted and described, and the rationale for final Riparian Reserve boundaries is presented.

Table F-1. Riparian Reserve Widths (in feet).

Stream/Waterbody/Wetland Type	Slope Distance of Riparian Reserve
Fish Bearing Streams	300 feet, or to a distance equal to the eight of two site-potential trees
Perennial, Nonfish-Bearing Streams	150 feet, or to a distance equal to the height of one site-potential tree
Intermittent Streams	100 feet, or to a distance equal to the height of one site potential tree
Constructed Ponds and Reservoirs and Wetlands greater than 1 acre	150 feet, or to a distance equal to the height of one site-potential tree.
Lakes and Natural Ponds	300 feet, or to a distance equal to the height of two site-potential trees
Wetlands less than 1 acre and Unstable and Potentially Unstable Areas	The extent of unstable and potentially unstable areas; or the wetland to the outer edges of the riparian vegetation.

A site-potential tree is defined as the average maximum height of the tallest dominant trees (200 years old or more) for a given site class. In the Forest Ecosystem Management Assessment Team report, the average height of site potential trees on forests east of the Cascades was estimated at 110 feet for the purposes of analysis.

Minimum widths of Riparian Reserves are expressed as whichever slope distance is greatest. The widths listed in the table are those that would be applied to one side of the stream. For example, a fish-bearing stream would have a 600 foot buffer (300 feet each side). In addition to these widths, Riparian Reserves must extend from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, and to the outer edges of riparian vegetation. Wetland, pond and reservoir Riparian Reserves must include the body of water or wetland and the area from the outer edges of the riparian vegetation, or to the extent of seasonally saturated soil, or to the extent of unstable or potentially unstable areas. Reservoir and pond Riparian Reserves are to be measured from the edge of the maximum pool elevation.

(2) Use the following sequence of decisions when establishing Riparian Reserve boundaries:

- a. **Identify floodplain boundaries** The entire 100-year floodplain should be included within the Riparian Reserve. The topographic break in slope between hillsides and the relatively flat floor of the stream valley will define a floodplain boundary. Floodplain soils and substrates are characterized by rounded edges on gravels, cobbles, or boulders as a result of being tumbled by streams. In contrast, hillslope substrates are more sharp and angular. Vegetation may change in age or composition at floodplain boundaries; however, many floodplains have forest vegetation as old or older than hillslope stands. Smaller, incised (downcut) streams and lower order (first, second, and third) streams frequently lack floodplains. Also, floodplains may not exist along non-riverine wetlands and lakes. In the absence of floodplains, historical high water levels should be used (see Section b, below).
- b. **Locate margins of active channels and shorelines (high water mark)** After floodplains (if they exist) have been identified, Riparian Reserves are delineated. Delineation of the Riparian Reserve starts at the edge of the active channel or mean high water level, and



extends outward horizontally on both sides. Active channels consist of all portions of the stream channel carrying water at normal high flows, not just the current wetted channel. This includes side channels and backwaters which may not carry water during summer low flow. All islands and gravel bars are included as part of the active channel. Active channel boundaries are indicated by abrupt topographic breaks where frequent channel scour has steepened streambanks. Frequently, plant abundance is reduced in areas of active channel modification, and plant communities are dominated by herbs and forbs. The high water mark is often marked by the vegetative litter carried in high flows and then deposited or caught in live vegetation.

Riparian Reserves around reservoirs, ponds and lakes should be measured from the high water level. This level may be indicated by evidence of erosion by wave action, reduced plant cover, topographic features and sharp transitions in plant community composition.

- c. **Lay Out Riparian Reserve Boundaries** For optimal management of riparian and other resources, Riparian Reserves should have variable widths that are delineated at ecological boundaries, not at arbitrary distances from the stream, lake or wetlands. Riparian-wetland areas are naturally irregular or asymmetrical in shape, in response to local topography, geology, groundwater, and plant communities. Consideration of topographic irregularities can both protect riparian resources and simplify harvest unit layout. Avoid straight, uniform Riparian Reserve boundaries.

## B. Riparian Reserve Protection

**Objective:** *To prevent damage to riparian vegetation and disturbance to streambanks, maintain or improve riparian conditions that support water-related functions, protect the natural flow of streams, and preserve nutrient cycling from woody debris.*

**Practices:** No timber harvest will be planned within a Riparian Reserve as part of the sustained yield timber management program. Where catastrophic events such as fire, flooding, wind or insect damage result in degraded riparian conditions, allow salvage and firewood cutting if required to attain Aquatic Conservation Strategy Objectives. Remove salvage trees only when watershed analysis determines that present and future woody debris needs are met and other Aquatic Conservation Strategy Objectives are not adversely affected.

Apply silvicultural practices in Riparian Reserves to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy Objectives (TM-1).

- (1) Guidelines for tree harvest and removal in or adjacent to Riparian Reserves are discussed in Riparian Reserves in the Timber Harvest section.
- (2) Retain all snags in the Riparian Reserve except where safety or fire hazard dictate removal (RA-2). Guidelines for woody debris in streams are discussed in Riparian Reserves in the Timber Harvest section.
- (3) Livestock grazing management in riparian-wetland areas is outlined in Yarding Methods in the Timber Harvest section.
- (4) Use interdisciplinary teams to develop riparian enhancement plans for rehabilitation of Riparian Reserves. Placement of large woody debris, creation of snags, planting conifers, or prescribed fire would be used where appropriate for riparian enhancement.
- (5) Avoid refueling, equipment maintenance, fuel storage, or other handling of petroleum products or other chemicals in or adjacent to Riparian Reserves.

- (6) No slashing, ripping, piling or mechanical site preparation (except for designated skid trail crossings, roads, or yarding corridors) will occur in Riparian Reserves, although riparian-wetland enhancement or wildlife projects can be allowed that consist of these types of activities in order to meet Aquatic Conservation Strategy Objectives. Other activities, such as mining, livestock grazing, and recreation are to be conducted in Riparian Reserves as described in the Mining, Livestock Grazing, and Recreation and Off-Highway Vehicle Use sections, respectively.
- (7) For proposed hydroelectric projects under the jurisdiction of the Federal Energy Regulatory Commission, provide timely, written comments regarding maintenance of instream flows and habitat conditions and maintenance/restoration of riparian resources and stream channel integrity. Request the Federal Energy Regulatory Commission to locate proposed support facilities outside of Riparian Reserves. For existing support facilities inside Riparian Reserves that are essential to proper management, provide recommendations to the Commission that ensure Aquatic Conservation Strategy objectives are met. Where these objectives cannot be met, provide recommendations to the Federal Energy Regulatory Commission that such support facilities should be relocated. Existing support facilities that must be located in Riparian Reserves should be located, operated, and maintained with an emphasis to eliminate adverse effects that retard or prevent attainment of Aquatic Conservation Strategy objectives (LH-2, LH-3).

For other hydroelectric and surface water development proposals in Tier 1 Key Watersheds, require instream flows and habitat conditions that maintain or restore riparian resources, favorable channel conditions, and fish passage. Coordinate this process with the appropriate state agencies. For other hydroelectric and surface water development proposals in all other watersheds, give priority emphasis to instream flows and habitat conditions that maintain or restore riparian resources, favorable channel conditions, and fish passage. Coordinate this process with the appropriate state agencies (LH-2).

- (8) Issue leases, permits, rights-of-way, and easements to avoid adverse effects that retard or prevent attainment of Aquatic Conservation Strategy Objectives. Where legally possible, adjust existing leases, permits, rights-of-way, and easements to eliminate adverse effects that retard or prevent the attainment of Aquatic Conservation Strategy Objectives. If adjustments are not effective and where legally possible, eliminate the activity. Priority for modifying existing leases, permits, rights-of-way and easements will be based on the actual or potential impact to and the ecological value of the riparian resources affected (LH-4).
- (9) Use land acquisition, exchange, and conservation easements to meet Aquatic Conservation Strategy objectives and facilitate restoration of fish stocks and other species at risk of extinction (LH-5).

## C. Wetlands

**Objective:** *To maintain the integrity and function of wetlands.*

**Practices:** (1) Manage vegetation to protect or enhance wetland areas.

- (2) Avoid surface disturbing activities in or adjacent to wetlands.
- (3) Avoid operations which would put pollutants into a wetland.
- (4) Follow practices outlined in the following sections: Permits under Activity Planning and Design; and Riparian Reserve Designation and Protection under the Riparian Reserves section.



# Soil Resource Protection

## A. Limiting Detrimental Soil Conditions

**Objective:** *To minimize soil erosion and soil productivity losses.*

**Practice:** The cumulative effects of detrimental soil conditions are not to exceed 20 percent of the total acreage within an activity area (the total area of ground, such as a timber sale unit or a slash treatment area including roads, skid trails, and landings). Detrimental soils conditions include detrimental compaction (see the Definitions and Proper Functioning Condition section), displacement, and creation of adverse cover conditions. Sites where the 20 percent standard is exceeded will require treatment, such as ripping, backblading or seeding.

## B. Soil Cover Retention and Establishment

**Objective:** *To retain and establish an adequate vegetative cover on disturbed sites to prevent erosion.*

**Practices:** (1) Minimum guidelines for the retention of effective ground cover will be prescribed as outlined in the following table for all soil-disturbing activities. Exceptions to these guidelines may be made due to site-specific resource considerations (for example, brush field scarification projects where bare soil is a specific objective). Effective ground cover is all living or dead herbaceous or woody materials and all rock fragments greater than 0.5 inch in diameter in contact with the ground surface. See Table F-2.

**Table F-2. Erosion Potential.**

Soil Surface Erosion Potential	General Slope Range (percent)	Minimum Effective Ground Cover (percent)	
		First Year	Second Year
Low	0-20	20-30	30-40
Moderate	20-35	30-45	40-60
High	35-50	45-60	60-75
Severe	50+	60-75	75-90

Soil surface erosion potential can be estimated using a variety of methods (that is, the Revised Universal Soil Loss Equation—RUSLE). A hydrologist or other knowledgeable resource professional can provide assistance in determining soil surface erosion potential.

- (2) Use native vegetation which allows natural succession to occur. Avoid interference with reforestation operations. Include application of seed, mulch, and fertilizer as necessary. Complete prior to fall rains.

## C. Retention of Small Woody Material

**Objective:** *To retain small woody (dead and down) material to sustain soil nutrients and a healthy forest ecosystem.*

**Practice:** Where practicable, maintain 10 tons or more of nine-inch diameter or smaller woody material per acre. In ponderosa pine forest land, 9 tons per acre of duff and litter (approximately ½ inch deep) and 2.2 tons per acre of material ¼ to 3 inches in diameter will be maintained. These target loads are designed to meet soil productivity and fire suppression objectives.

## Fragile Soils

**Objective:** To minimize surface disturbance on Timber Production Capability Classification fragile soils.

The best management practices in this section are to be used in addition to those in other sections.

Three categories of fragile soils sensitive to surface disturbing activities are identified in the Klamath Falls Resource Area Timber Production Capability Classification:

<b>Fragile Slope Gradient</b>	These sites consist of steep to extremely steep slopes that have a high potential for surface ravel. Gradients commonly range from 60 to greater than 100 percent.
<b>Fragile Mass Movement</b>	These sites consist of deep seated, slump, or earth flow types of landslides with undulating topography and slope gradients generally less than 60 percent. Soils are derived from volcanic tuffs or breccias.
<b>Fragile Groundwater</b>	These sites have high water tables where water is at or near the soil surface for sufficient periods of time that vegetation survival and growth are affected.

### A. Roads

#### 1. Planning

**Practice:** Avoid fragile soils when planning road systems.

#### 2. Design

**Practices:** (1) Design haul roads with rock surface on Fragile Mass Movement and Fragile Groundwater soils.

(2) Use slotted risers, trash racks, or over-sized culverts to prevent culvert plugging on Fragile Mass Movement soils.

#### 3. Erosion Control

**Practice:** Stabilize cutbanks on Fragile Mass Movement soils using rock buttressing.

#### 4. Maintenance

**Practice:** Minimize ditch cleaning on Fragile Mass Movement soils to retard slumping of road and cutbanks.

#### 5. Access Restrictions

**Practice:** Block unsurfaced roads on fragile soils to prohibit motorized vehicle use.

### B. Timber Harvest

#### 1. Yarding Methods - Cable

**Practices:** (1) Use full or partial suspension when yarding on Fragile Slope Gradient and Fragile Groundwater soils.

(2) Restrict yarding and hauling to dry season (generally May 15 to October 15) on Fragile Mass Movement and Fragile Groundwater soils.

## **2. Yarding Methods - Helicopter**

**Practice:** Employ helicopter yarding to avoid or minimize new road construction on fragile soils.

## **C. Silviculture**

### **1. Pile Burning**

#### **a. Hand Piles**

**Practices:** (1) Put slash in yarding corridors on Fragile Slope Gradient soils to control erosion, allowing adequate space to plant trees.

(2) Burn hand piles on Fragile Slope Gradient soils only if they prevent planter access.

#### **b. Machine Piles**

**Practice:** Avoid machine piling or ripping on Fragile Mass Movement and Fragile Groundwater soils.

## **D. Wildfire and Prescribed Fire**

### **1. Suppression**

**Practices:** (1) Apply suppression on fragile soils based on environmental and operational conditions that exist at time of ignition (conditional suppression). Use the Soil Impact Evaluation Worksheet developed for Emergency Fire Situation Analysis to determine the appropriate level of suppression and the risk of adverse impacts from suppression activities.

(2) Limit the use of tractors and other major surface-disturbing activities on all fragile soils.

### **2. Rehabilitation**

**Practice:** Assure prompt rehabilitation on fragile soils through seeding or planting of native species or species that will quickly establish desired ground cover conditions.

### **3. Prescribed Fire**

**Practices:** (1) Prescribe cool burns and only burn in the spring on Fragile Slope Gradient soils.

(2) Restrict broadcast burns to north slopes on Fragile Slope Gradient soils.

# **Roads**

## **A. Planning**

**Objective:** *To plan road systems that meet resource objectives and minimize detrimental impacts on water and soil resources.*

**Practices:** (1) Use an interdisciplinary team to develop an overall transportation system and Transportation Management Objectives.

(2) Develop Transportation Management Objectives to meet Aquatic Conservation Strategy Objectives. As a minimum, Transportation Management Objectives will include provisions for the following activities: during-storm inspections and maintenance; post-storm inspections

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and maintenance; during road operation and maintenance, giving high priority to the identification and correction of road drainage problems that contribute to degradation of riparian resources; regulation of traffic during wet periods to prevent damage to riparian resources; and establishment of the purpose of each road (RF-7).

- (3) Establish Transportation Management Objectives that minimize adverse environmental impacts.
- (4) Avoid fragile and unstable areas.
- (5) Encourage use of best management practices where not specifically required in reciprocal right-of-way agreements.
- (6) Cooperate with Federal, state, and county agencies to achieve consistency in road design, operation, and maintenance necessary to attain Aquatic Conservation Strategy Objectives (RF-1).
- (7) Complete a watershed analysis (including appropriate geotechnical analyses) prior to any decision to construct a new road in a Riparian Reserve. Reduce existing road mileage in Key Watersheds and/or allow no net increase in road mileage in Key Watersheds (RF-2).
- (8) Determine the influence of each road on the Aquatic Conservation Strategy objectives thorough watershed analysis. Meet Aquatic Conservation Strategy objectives by: reconstructing roads and associated drainage features that pose a substantial risk; prioritizing reconstruction based on current and potential impact to riparian resources and the ecological value of the riparian resources affected; closing and stabilizing, or obliterating and stabilizing roads based on the ongoing and potential effects to Aquatic Conservation Strategy objectives and considering short-term and long-term transportation needs (RF-3).

### **B. Location**

**Objective:** *To minimize soil erosion, water quality degradation, and disturbance of riparian vegetation.*

**Practices:** (1) Locate roads away from Riparian Reserves (RF-2).

- (2) Locate roads on stable positions (for example, ridges, natural benches, and flatter transitional slopes near ridges and valley bottoms). When crossing unstable areas is necessary, implement additional mitigation measures.
- (3) Avoid headwalls, midslope locations on steep unstable slopes, seeps, old landslides, slopes in excess of 60 percent, and areas where the geologic bedding planes or weathering surfaces are inclined with the slope.
- (4) Locate roads to minimize heights of cutbanks. Avoid high, steeply sloping cutbanks in highly fractured bedrock.
- (5) Locate roads on well-drained soil types. Vary the grade to avoid wet areas.
- (6) Locate stream crossing sites where channels are well defined, unobstructed and straight. Minimize the area of road that enters a Riparian Reserve.

## C. Design

### 1. General

**Objective:** *To design the lowest standard of road consistent with use objectives and resource protection needs.*

**Practices:** (1) Base road design standards and design criteria on Transportation Management Objectives, such as traffic requirements of the proposed activity, the overall Resource Area transportation plan, economic considerations, safety requirements, resource objectives, and the need to minimize damage to the environment.

- (2) Consider future maintenance concerns and needs when designing roads.
- (3) Preferred road gradients are 2 to 10 percent with a maximum grade of 15 percent. Consider steeper grades in those situations where they will result in less environmental impact.
- (4) Road Surface Configurations
  - a. Outsloping - sloping the road prism to the outside edge for surface drainage is normally recommended for local spurs or minor collector roads where low volume traffic and lower traffic speeds are anticipated. It is also recommended in situations where long intervals between maintenance will occur and where minimum excavation is desired. Outsloping is not recommended on gradients greater than 8 to 10 percent (RF-5).
  - b. Insloping - sloping the road prism to the inside edge is an acceptable practice on roads with gradients of more than 10 percent and where the underlying soil formation is very rocky and not subject to appreciable erosion or failure.
  - c. Crown and Ditch - this configuration is recommended for arterial and collector roads where traffic volume, speed, intensity and user comfort are a consideration. Gradients may range from 2 to 15 percent as long as adequate drainage away from the road surface and ditchlines is maintained.
- (5) Minimize excavation through the following actions: use of balance earthwork, narrow road width, and endhauling where slopes are greater than 60 percent.
- (6) Locate waste areas suitable for depositing excess excavated material.
- (7) Conduct slope rounding on tops of cut slopes in clayey soils to reduce sloughing and surface ravel. Avoid this practice in erosion classes I, II, VII, and VIII (see Table F-3 at the end of this appendix).
- (8) Surface roads if they will be subject to traffic during wet weather. The depth and gradation of surfacing will be determined by traffic type, frequency, weight, maintenance objectives, and the stability and strength of the road foundation and surface materials.
- (9) Provide vegetative or artificial stabilization of cut and fill slopes in the design process. Avoid establishment of vegetation where it inhibits drainage from the road surface or where it restricts safety or maintenance.
- (10) Prior to completion of design drawings, field check the design to assure that it fits the terrain, drainage needs have been satisfied, and all critical slope conditions have been identified and adequate design solutions applied.
- (11) Minimize the disruption of natural hydrologic flow paths, including diversion of streamflow and interception of surface and subsurface flow.

## 2. Surface Cross Drains

**Objective:** *To design road drainage systems that minimize concentrated water volume and velocity and therefore to reduce soil movement and maintain water quality.*

- Practices:**
- (1) Design cross drains in ephemeral or intermittent channels to lay on solid ground rather than on fill material to avoid road failures.
  - (2) Design placement of all surface cross drains to avoid discharge onto erodible (unprotected) slopes or directly into stream channels. Provide a buffer or sediment basin between the cross drain outlet and the stream channel.
  - (3) Locate culvert or drainage dips in such a manner to avoid discharge onto unstable terrain such as headwalls, slumps, or block failure zones. Provide adequate spacing to avoid accumulation of water in ditches or surfaces through these areas.
  - (4) Provide energy dissipators (for example, rock material) at cross drain outlets or drain dips where water is discharged onto loose material or erodible soil or steep slopes.
  - (5) Place protective rock at culvert entrance to streamline water flow and reduce erosion.
  - (6) Use the guide for drainage spacing by soil erosion classes and road grade shown in Tables F-3 and F-4 at the end of this appendix.
  - (7) Use drainage dips in place of culvert on roads which have gradients less than 10 percent or where road management objectives result in blocking roads. Avoid drainage dips on road gradients greater than 10 percent.
  - (8) Locate drainage dips where water might accumulate or where there is an outside berm which prevents drainage from the roadway.
  - (9) When sediment is a problem, design cross drainage culverts or drainage dips immediately upgrade of stream crossings to prevent ditch sediment from entering the stream.
  - (10) Varying gradients is recommended in erodible and unstable soils to reduce surface water volume and velocities and culvert requirements.

## 3. Permanent Stream Crossings

**Objective:** *To prevent stream crossings from being a direct source of sediment to streams thus minimizing water quality degradation; to provide unobstructed access to spawning and rearing areas for anadromous and resident fish.*

- Practices:**
- (1) Design culverts to provide adult and juvenile fish passage both upstream and downstream. Use pipe arch culverts on most fishery streams. Use bottomless arch culverts and bridges where stream gradients are greater than 5 percent, to accommodate stream discharge, and when the value of the fishery resource dictates special engineering considerations necessary to ensure uninterrupted fish passage. On fish bearing streams, culverts should be placed at a zero (0) percent grade (RF-6).
  - (2) Use the theoretical 100-year flood (including considerations for bedload and debris) as design criteria for newly-installed culverts, bridges and other stream crossings. On a case-by-case basis, replace existing culverts posing a substantial risk to riparian conditions with a structure designed for a theoretical 100-year flood and one that meets fish passage requirements, if applicable (RF-4).



- (3) Minimize the number of crossings on any particular stream.
- (4) Where feasible, design culvert placement on a straight reach of stream to minimize erosion at both ends of the culvert. Design adequate stream bank protection (for example, rip-rap) where scouring would occur. Avoid locations that require a stream channel to be straightened beyond the length of a culvert to facilitate installation of a road crossing.

#### **4. Temporary Stream Crossings**

**Objective:** *To design temporary stream crossings that minimize disturbance of the stream and riparian environment.*

- Practices:**
- (1) Evaluate the advantages and disadvantages of a temporary versus permanent crossing structure for access to the area during all seasons over the long term in terms of economics, maintenance, and resource requirements.
  - (2) Design temporary structures such as pre-fab temporary timber bridges, multiple culverts with minimum fill height, cattleguard crossings, or log cribs to keep vehicles out of the stream.
  - (3) Minimize the number of temporary crossings on a particular stream.
  - (4) Avoid temporary stream crossings on fishery streams during spawning, hatching and migration.

#### **5. Low Water Ford Stream Crossings**

**Objective:** *To design low water fords that minimize disturbance of the stream and riparian environment.*

**Practice:** Use only when site conditions make it impractical or uneconomical to utilize a permanent or temporary crossing structure.

### **D. Construction**

**Objective:** *To create a stable roadway while minimizing soil erosion and potential water quality degradation.*

#### **1. Roadway Construction**

- Practices:**
- (1) Limit road construction to the dry season (generally between May 15 and October 15). When conditions permit operations at the limits of the dry season, keep erosion control measures current with ground disturbance, to the extent that the affected area can be rapidly closed/ blocked and weatherized if weather conditions warrant.
  - (2) Manage road construction so that any construction can be completed and bare soil can be protected and stabilized prior to fall rains.
  - (3) Confine preliminary equipment access (pioneer roads) to within the roadway construction limits.
  - (4) Construct pioneer roads so as to prevent undercutting of the designated final cutslope and prevent avoidable deposition of materials outside the designated roadway limits. Conduct slope rounding at the first opportunity during construction to avoid excess amounts of soil being moved after excavation and embankment operations are completed.
  - (5) Use controlled blasting techniques that minimize amount of material displaced from road location.



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- (6) Construct embankments, including waste disposal sites, of appropriate materials (no slash or other organic matter) using one or more of the following methods:
  - a. layer placement (tractor compaction),
  - b. layer placement (roller compaction),
  - c. controlled compaction (85 to 95 percent maximum density).

Slash and organic material may remain under waste embankment areas outside the road prism and outside units planned for broadcast burning.

- (7) Avoid sidecasting where it will adversely affect water quality or weaken stabilized slopes. Place excavated material away from Riparian Reserves.
- (8) Place surface drainage prior to fall rains.
- (9) Clear drainage ditches and natural watercourses of woody material deposited by construction or logging above culverts prior to fall rains.

### **2. Permanent Stream Crossing Construction**

**Practices:** (1) Confine culvert installation to the low flow period (generally June 15 to September 15) to minimize sedimentation and the adverse effects of sediment on aquatic life.

- (2) Divert the stream around the work area to minimize downstream sedimentation during construction. After construction, the return the stream to its natural channel. Ensure, through proper construction and maintenance, that the stream will remain in its natural channel in the event of crossing failure.
- (3) Install culverts as close to zero percent slope as possible on fishery streams but not to exceed 0.5 percent. Place culverts in the streambed at the existing slope gradient on larger non-fishery streams. Place energy dissipators (for example, large rock) at the outfall of culverts on small nonfishery streams to reduce water velocity and minimize scour at the outlet end.
- (4) Countersink culverts 6 to 8 inches below the streambed to minimize scouring at the outlet. Increase culvert diameters accordingly.
- (5) Limit activities of mechanized equipment in the stream channel to the area necessary for installation.
- (6) Place permanent stream crossing structures on fishery streams before heavy equipment moves beyond the crossing area. Where this is not feasible, install temporary crossings to minimize stream disturbance.
- (7) Place rip-rap on fills around culvert inlets and outlets.

### **3. Temporary Stream Crossing Construction**

**Practices:** (1) Where possible, limit the installation and removal of temporary crossing structures to once during the same year and within the prescribed work period. Installation and removal should occur during the low flow period (generally June 15 to September 15).

- (2) Use backfill material that is as soil-free as practicable over temporary culverts. Whenever possible use washed river rock covered by pit run or one inch minus as a compacted running surface.
- (3) Spread and reshape clean fill material to the original lines of the streambed after a crossing is removed to ensure the stream remains in its channel during high flow.

- (4) Use log cribbing in tractor logging units when it is impractical to use a culvert and rock backfill material. Remove upon completion of logging the unit.
- (5) Limit activities of mechanized equipment in the stream channel to the area that is necessary for installation and removal operations.
- (6) Remove stream crossing drainage structures and in-channel fill material during low flow and prior to fall rains. Reestablish natural drainage configuration.

#### **4. Low Water Ford Stream Crossing Construction**

**Practices:** (1) Restrict construction and use to low flow period (generally June 15 to September 15).

- (2) Use washed rock/gravel or concrete slab in the crossing.
- (3) Apply rock on road approaches within 150 feet of each side of the ford to prevent washing and softening of the road surface.

#### **E. Soil Resource Protection**

**Objective:** *To limit and mitigate soil erosion and sedimentation.*

**Practices:** (1) Apply protective measures to all areas of disturbed, erosion-prone, unprotected ground, including waste disposal sites, prior to fall rains. Protective measures may include water bars, grass seeding, planting deep rooted vegetation, and/or mulching. Armor or buttress fill slopes and unstable areas with rock which meets construction specifications. Revegetation with native species is preferred, except where overriding concerns to reduce sediment dictate the use of annuals or other quickly establishing species.

- (2) Use seasonal restrictions on unsurfaced roads.
- (3) Remove snow on haul roads in a manner which will protect roads and adjacent resources. Remove or place snow berms to prevent water concentration on the roadway or on erodible sideslopes or soils.

#### **F. Road Renovation/Improvement**

**Objective:** *To restore or improve a road to a desired standard in a manner that minimizes sediment production and water quality degradation.*

- Practices:** (1) Improve flat gradients to a minimum of two percent or provide raised subgrade sections (turnpike) to avoid saturation of the road prism.
- (2) Reconstruct culvert catchbasins to specifications. Catchbasins in solid rock need not be reconstructed provided water flow is not restricted by soil, rock, or other debris.
  - (3) Identify potential water problems caused by off-site disturbance and add necessary drainage facilities.
  - (4) Identify ditchline and outlet erosion caused by excessive flows and add necessary drainage facilities and armoring.
  - (5) Replace undersized culverts and repair damaged culverts and downspouts.
  - (6) Add additional full-rounds, half-rounds, and energy dissipators as needed.

## **Appendix F - Best Management Practices**

- (7) Correct special drainage problems (for example, high water table, seeps) that affect stability of subgrade through the use of perforated drains, geotextiles, or drainage bays.
- (8) Eliminate undesirable berms that retard normal surface runoff.
- (9) Restore outslope or crown sections.
- (10) Avoid disturbing backslope while reconstructing ditches.
- (11) Surface inadequately surfaced roads that are to be left open to traffic during wet weather.
- (12) Require roadside brushing be done in a manner that prevents disturbance to root systems (such as, avoid using excavators for brushing).
- (13) Prioritize reconstruction and maintenance based on current and potential impacts to Riparian Reserves.

### **G. Road Maintenance**

**Objective:** *To maintain roads in a manner that protects water quality and minimizes erosion and sedimentation.*

- Practices:**
- (1) Provide basic custodial care to protect the road investment and to ensure minimal damage to adjacent land and resources. Repair erosion in its early stages.
  - (2) Perform blading and shaping to conserve existing surface material, retain the original crowned or outsloped self-draining cross section, prevent or remove rutting berms (except those designed for slope protection) and other irregularities that retard normal surface runoff. Avoid wasting loose ditch or surface material over the shoulder where it can cause stream sedimentation or weaken slump prone areas. Avoid undercutting backslopes.
  - (3) Keep road inlet and outlet ditches, catchbasins, and culverts free of obstructions, particularly before and after winter snowfall and spring runoff. However, hold routine machine cleaning of ditches to a minimum during wet weather.
  - (4) Grading operations are to be conducted to prevent sedimentation and to dispose of surface water without ponding or concentrating water flow in unprotected channels. Schedule grading operations during time periods of the least erosion hazard (generally during the dry season, May 15 to October 15).
  - (5) Retain vegetation on cut slopes and ditches unless it poses a safety hazard or restricts maintenance activities. Cut roadside vegetation rather than pulling it out and disturbing the soil.
  - (6) Inspect areas subject to road or watershed damage during periods of high runoff.

### **H. Dust Abatement**

**Objective:** *To minimize movement of fine sediment from roads; to prevent introduction into waterways of chemicals applied for dust abatement.*

- Practices:**
- (1) Use dust palliatives or surface stabilizers to reduce surfacing material loss and buildup of fine sediment that may wash off into water courses.
  - (2) Closely control application of dust palliatives and surface stabilizers, equipment cleanup, and disposal of excess material to prevent contamination or damage to water resources.

## **I. Access Restrictions**

**Objective:** *To reduce road surface damage and therefore minimize erosion and sedimentation.*

- Practices:** (1) Barricade or block roads using gates, guard rails, earth/log barricades, boulders, logging debris, or a combination of these methods. Avoid blocking roads that will need future maintenance (that is, culverts, potential slides, etc.) with unremovable barricades. Use guardrails, gates, or other barricades capable of being opened for roads needing future maintenance.
- (2) Provide maintenance of blocked roads in accordance with design criteria.
- (3) Install waterbars, cross drains, cross sloping, or drainage dips if not already on road to assure drainage.
- (4) Scarify, mulch (weed free), and/or seed with native species for erosion control.

## **J. Obliteration of Roads and Landings**

**Objective:** *To minimize or reduce sedimentation and improve site productivity by obliterating roads and landings and rehabilitating the land.*

- Practices:** (1) Rip temporary spur roads and landings by an approved method to remove ruts, berms, and ditches while leaving or replacing surface cross drain structures.
- (2) Return roads or landings not needed for future resource management to resource production through ripping and/or revegetation with native species. Apply weed free mulch and fertilizer where appropriate.

## **K. Reclamation of Rock Quarries**

**Objective:** *To minimize sediment production from quarries and associated crusher pad developments susceptible to erosion due to steep sideslopes, lack of vegetation, or their proximity to water courses.*

- Practices:** (1) Prior to excavation, remove topsoil and place at a site with minimal erosion potential. Stockpile topsoil for surface dressing during the post-operation rehabilitation.
- (2) Use culverts and rip-rap for crusher pad drainage when necessary.
- (3) Stabilize quarry sides and general quarry area consistent with objectives for other resources, such as recreation and wildlife.
- (4) Revegetate with native species, apply weed free mulch, and provide adequate drainage to minimize erosion.
- (5) Rip, waterbar, block, fertilize and revegetate roads to quarries where no future entry is planned.

## Timber Harvest

### A. Riparian Reserves

#### 1. General Guidelines

See the discussions under Riparian Reserve Designation and Protection in the Riparian Reserves section.

#### 2. Tree Felling Adjacent to Streams or Riparian Reserves

**Objective:** To prevent damage to riparian vegetation, disturbance of streambanks, and accumulation of slash in stream channels.

**Practices:** (1) Directionally fell trees away from Riparian Reserves when harvesting within a tree length of any stream or Riparian Reserve.

(2) Where feasible, leave in place unbuckled and unlimbed any trees felled within a Riparian Reserve, consistent with management for fish habitat.

#### 3. Yarding Across Riparian Reserves

**Objective:** To prevent damage to riparian vegetation, disturbance of streambanks, and accumulation of slash in stream channels.

**Practices:** (1) Avoid yarding through Riparian Reserves when possible.

(2) Designate yarding corridors prior to yarding.

(3) Minimize number and width of yarding corridors. The maximum width of any corridor will be 30 feet. No more than 25 percent of the overstory canopy within the corridor will be removed to facilitate yarding operations.

(4) Leave vegetation in Riparian Reserves that is cut for yarding corridors to meet stream and riparian objectives. Consider falling conifers into the stream and leaving them to contribute to the stream ecosystem.

(5) During cable yarding operations across Riparian Reserves, obtain complete suspension of logs over streambanks (or one end suspension if complete suspension is not possible).

(6) Do not place skid trails in Riparian Reserves except at designated crossings. Where feasible, locate skid trails perpendicular to Riparian Reserves and stream channels. Avoid tractor yarding across fishery streams and associated Riparian Reserves. All skid trails that enter Riparian Reserves will be seeded with native species after use or prior to first rains, whichever comes first.

(7) Install temporary stream crossings across Riparian Reserves of nonfishery streams prior to tractor yarding operations. Select stable, naturally armored areas. Minimize the area of disturbance. Use a culvert and clean rock or logs for temporary stream crossings. Install during low flows and remove prior to fall rains in the same season.

#### 4. Woody Debris in Streams

**Objective:** To protect the natural flow of streams, to provide unobstructed passage of storm flows, and to preserve nutrient cycling from woody debris.

**Practices:** (1) Avoid removal of down trees or logs in stream channels and Riparian Reserves.

(2) Remove excessive concentrations of logging slash from all streams prior to fall rains and place above high water mark.

(3) Remove all logging slash in streams resulting from the current timber sale for a distance of 100 feet above culverts. Hand pile slash above high water mark.

## **5. Landings Near Riparian Reserves**

**Objective:** *To preclude damage to Riparian Reserve vegetation and to prevent sediment or pollutants from entering stream channels.*

**Practice:** Avoid locating landings and helicopter service pads within 50 feet of Riparian Reserves.

## **B. Yarding Methods**

### **1. General Guidelines**

Conditions outlined in the Soil Resource Protection section will be met.

### **2. Cable**

**Objective:** *To minimize soil damage and erosion caused by displacement or compaction.*

**Practices:** (1) Cable yard when average slopes exceed 35 percent.

(2) Use full or partial suspension when yarding on erodible or ravel prone areas where practical.

(3) Use full or partial suspension with seasonal restrictions on areas of high water tables.

(4) Use seasonal restriction if required suspension cannot be achieved by yarding equipment.

(5) Avoid downhill yarding.

### **3. Tractor**

**Objective:** *To minimize loss of soil productivity and reduce potential for surface runoff and subsequent water quality degradation.*

**Practices:** (1) In previously unentered stands, use designated skid roads to limit soil compaction to 12 percent or less of the harvest area.

(2) In previously entered stands, inventory existing soil compaction and design proposed management activities to mitigate or avoid reductions in soil productivity. Utilize existing skid roads. On most timber harvest units, establish a network of permanent, designated skid trails not to exceed 12 percent of an activity area. Where feasible, rip all skid roads used in final entry harvest or roads not needed as part of the network of permanent, designated skid roads.

(3) Rip skid roads discontinuously, preferably with winged ripper teeth when the soil is dry (generally 15-20 percent or less soil moisture content at a six inch depth). Rips should be spaced no more than 36 inches apart and from 12 to 18 inches deep or to bedrock, whichever is shallower. Subsoiling should generally result in 80 percent of the compacted zone being fractured with 80 percent of the fractured soil material as clods of less than six inches in size.

(4) Minimize the width of skid roads.



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- (5) Avoid placement of skid roads through areas with high water tables.
- (6) Use appropriate seasonal restrictions that would result in no off-site damage from designated skid roads. Operation on both new and existing skid roads will minimize soil displacement and will occur when soil moisture content provides the most resistance to compaction.
- (7) Allow logging on snow whenever practicable when snow depths average 20 inches or greater and negligible ground surface exposure occurs during the operation. Logging on frozen ground may also be allowed when the ground is frozen to a depth of 6 inches.
- (8) Restrict tractor operations to slopes less than 35 percent.
- (9) Construct waterbars on skid roads according to guidelines in this section under Waterbars.
- (10) Consider end-lining and felling to the lead to minimize the effects of tractor yarding.

### **4. Helicopter**

**Objective:** *To minimize surface disturbance.*

**Practice:** Employ helicopter yarding to avoid or minimize new road construction in high risk watersheds, on steep slopes, or in other areas with resource concerns, where practicable.

### **5. Horse**

**Objective:** *To minimize soil disturbance, soil compaction, and soil erosion.*

**Practices:** (1) Limit horse logging to slopes less than 20 percent.

(2) Construct hand waterbars on horse skid trails according to guidelines in the Timber Harvest section under Waterbars.

(3) Limit harvest activity to times when soil moisture content at a six-inch depth is generally less than 15 to 20 percent by weight.

### **C. Use of a Mechanical Harvester**

**Objective:** *To minimize soil disturbance, soil compaction, and soil erosion.*

**Practice:** Mechanical harvesting will generally meet the following minimal conditions:

- a. Operations will be restricted to dry conditions (generally less than 15 to 20 percent soil moisture by weight).
- b. The lowest ground pressure machine capable of meeting objectives will be used when available.
- c. Conditions outlined in the Soil Resource Protection and this section under Yarding Methods, Cable, will be met.

### **D. Landings**

**Objective:** *To minimize soil disturbance, soil erosion, soil productivity losses and water quality degradation.*

**Practices:** (1) Minimize the size and number of landings.

- (2) Locate landings at approved sites.
- (3) Avoid placing landings adjacent to or in meadows or other wetland areas.
- (4) Clear or excavate landings to minimum size needed for safe and efficient operations.
- (5) Select landing locations considering the least amount of excavation, erosion potential, and where sidecast will not enter drainages or damage other sensitive areas.
- (6) Deposit excess excavated material on stable sites where there is no erosion potential. Construct waste disposal sites according to guidelines in the Roads Section, under Construction, Roadway Construction, number 6.
- (7) Restore landings to the natural configuration or shape to direct the runoff to preselected spots where water can be dispersed to natural, well-vegetated, gentle ground.

## E. Waterbars

**Objective:** To minimize soil erosion and soil productivity losses.

- Practices:** (1) Construct adequate waterbars on roads, spurs, skid roads, yarding corridors, and fire lines prior to fall rains.
- (2) For waterbar spacing, based on gradient and erosion class, use Table F-5.

**Table F-5. Water Bar Spacing (in feet)<sup>1</sup>**

Gradient (percent)	Erosion Class <sup>2</sup>		
	High	Moderate	Low
3-5	200	300	400
6-10	150	200	300
11-15	100	150	200
16-20	75	100	150
21-35	50	75	100
36+	50	50	50

<sup>1</sup> Spacing is determined by slope distance and is the maximum allowed for the grade.

<sup>2</sup> The following guide lists rock types according to erosion class:

- High: granite, sandstone, andesite porphyry, glacial or alluvial deposits, soft matrix conglomerate, volcanic ash, pyroclastics;  
 Moderate: basalt, andesite, quartzite, hard matrix conglomerate, rhyolite;  
 Low: metasediments, metavolcanics, hard shale

- (3) Use the following techniques to construct waterbars:
- a. Open the downslope end of the waterbar to allow free passage of water.
  - b. Construct the waterbar so that it will not deposit water where it will cause erosion.
  - c. Compact the waterbar berm to prevent water from breaching the berm.
  - d. Skew waterbars no more than 30 degrees from perpendicular to the centerline of the trail or road.



# Silviculture

## A. Site Preparation

### 1. Slashing

**Objective:** *To prevent damage to riparian vegetation, disturbance of streambanks, and accumulation of slash in stream channels.*

**Practices:** (1) No slashing within Riparian Reserves.

(2) Directionally fell trees away from Riparian Reserves when slashing within a tree length of any stream or Riparian Reserve, except in cases where trees must be yarded across Riparian Reserves. In this instance, full tree yard to the lead.

### 2. Gross Yarding

**Objective:** *To achieve a cool burn on sensitive soils and maintain protective duff layer.*

**Practice:** Consider the following in writing a prescription for gross yarding to reduce burn intensities: long-term site productivity, ecosystem dynamics, regeneration success, prescribed fire intensities, and smoke emissions.

### 3. Broadcast Burning

See the Wildfire and Prescribed Fire section.

### 4. Piling

#### a. Hand Piling

**Objective:** *To protect Riparian Reserves and stream channels and to prevent soil damage due to high burn intensity.*

**Practices:** (1) Minimize the number and size of piles within designated Riparian Reserves.

(2) Burn piles when soil and duff moisture are high.

#### b. Tractor Piling

**Objective:** *To protect Riparian Reserves and soil productivity and to prevent soil damage due to compaction, displacement, and high burn intensity.*

**Practices:** (1) Where practicable, avoid tractor piling by requiring the removal and utilization of excessive biomass and residual slash, subject to guidelines in the Soil Resource Protection section, under Retention of Small Woody Debris.

(2) No piles or tractor operations within Riparian Reserves.

(3) Restrict tractor operations to dry conditions with generally less than 15-20 percent soil moisture content in the upper six inches of soil.

(4) Restrict tractors to slopes less than 35 percent.

(5) Construct small diameter piles or pile in windrows using brush blades.

- (6) Avoid piling concentrations of large logs and stumps.
- (7) Pile small material (3 to 8 inches diameter size).
- (8) Avoid displacement of duff and topsoil into piles or windrows.
- (9) Make only two machine passes (one round trip) over the same area wherever practicable.
- (10) Use the lowest ground pressure machine capable of meeting objectives.
- (11) Burn piles when soil and duff moisture are high.
- (12) Rip entire area to maintain soil productivity except that occupied by piles. Use winged ripper teeth and rip on contour to minimum depth of 12 inches. Minimize ripping on clayey soils.
- (13) Use alternative equipment or techniques for site preparation or slash treatment, such as excavators to pile slash or low ground pressure chippers, to minimize compaction.
- (14) Conditions outlined in the Soil Resource Protection section will be met.

## **B. Fertilization**

**Objective:** *To protect water quality.*

**Practices:** (1) Avoid aerial application when wind speeds would cause drift.

(2) Locate heliports and storage areas away from stream channels.

(3) No application within 100 feet of perennial streams or water bodies which have beneficial use(s) recognized by the state.

(4) Avoid direct application to intermittent streams or channels without beneficial use(s) recognized by the state.

## **C. Precommercial Thinning**

**Objective:** *To protect Riparian Reserves.*

**Practices:** (1) Fell trees away from streams.

(2) No cutting within Riparian Reserves excluded from timber harvest except to meet Riparian Reserve management objectives.

## **D. Brushing**

**Objective:** *To minimize soil erosion.*

**Practice:** Maintain soil cover conditions outlined in the Soil Resource Protection section by scattering limbs and debris from the brushing operation over the treated areas.

## Firewood Program

### A. Roads

**Objective:** *To prevent erosion and water quality degradation.*

- Practices:** (1) Seasonally restrict firewood cutting if access is by an unsurfaced road.
- (2) Clean all road surfaces, ditches, and catchbasins of debris from wood cutting.

### B. Harvest

#### 1. Riparian Reserves

**Objective:** *To prevent damage to riparian vegetation, disturbance of streambanks, and accumulation of slash in stream channels.*

- Practices:** (1) Follow practices identified in the Timber Harvest section, under Riparian Reserves.
- (2) Do not permit firewood cutting in Riparian Reserves except to meet watershed, wildlife habitat, or Aquatic Conservation Strategy objectives.

#### 2. Yarding Methods

**Objective:** *To minimize soil damage and soil erosion.*

- Practice:** Follow practices listed in the Timber Harvest section, under Riparian Reserves and Yarding Methods.

## Wildfire and Prescribed Fire

### A. Prevention

**Objective:** *To minimize occurrence of severe intensity wildfires in Riparian Reserves, on erosion-susceptible soils, and in high risk watersheds.*

- Practices:** (1) Utilize prescribed burning to reduce both natural and activity slash (fuel) adjacent to and/or within these areas.
- (2) Design fuel treatment and fire suppression strategies, practices, and activities to meet Aquatic Conservation Strategy objectives, and to minimize disturbance of riparian ground cover and vegetation. Strategies should recognize the role of fire in ecosystem function and identify those instances where fire suppression or fuel management activities could be damaging to long-term ecosystem function (FM-1).
- (3) Design prescribed burn projects and prescriptions to contribute to attainment of Aquatic Conservation Strategy objectives (FM-4).

### B. Suppression

**Objective:** *To minimize water quality degradation while achieving rapid and safe suppression of a wildfire.*

**Practices:** (1) Use the Soil and Water Resources Impact Evaluation Worksheets during Emergency Fire Situation Analysis to determine appropriate suppression methods.

- (2) Apply intensive and conditional suppression in high-risk watersheds and conditional suppression in Riparian Reserves. In Riparian Reserves, the goal of wildfire suppression is to limit the size of all wildfires. When watershed and/or landscape analysis, or province-level plans are completed and approved, some natural fires may be allowed to burn under prescribed conditions. Rapidly extinguishing smoldering coarse woody debris and duff should be considered to preserve these ecosystem elements (FM-other).
- (3) Locate incident bases camps, helibases, staging areas, helispots and other centers for incident activities outside of Riparian Reserves. If the only suitable location for such activities is within an Riparian Reserve, an exemption may be given following a review and recommendation by a resource advisor. The advisor will prescribe the location, use conditions, and rehabilitation requirements. Utilize an interdisciplinary team to predetermine suitable incident base and helibase locations (FM-2).
- (4) Exclude tractors within Riparian Reserves. Limit use of heavy equipment near Riparian Reserves, on slopes greater than 35 percent, and in high-risk watersheds. Where fire trail entry into a Riparian Reserve is essential, angle the approach rather than have it perpendicular to the Riparian Reserve.
- (5) Minimize delivery of chemical retardant, foam, or additives to surface waters. An exception may be warranted in situations where overriding immediate safety imperatives exist, or, following review and recommendation by a resource advisor, when an escape would cause more long-term damage. Apply aerial retardant adjacent to Riparian Reserves by making passes parallel to Riparian Reserves (FM-3).

## C. Rehabilitation

**Objective:** *To protect water quality and soil productivity with consideration for other resources.*

**Practices:** (1) Utilize information from burned area surveys to determine if watershed emergency fire rehabilitation is needed.

- (2) Develop a fire rehabilitation plan through an interdisciplinary process. Whenever Riparian Reserves are significantly damaged by a wildfire or a prescribed fire burning out of prescription, immediately establish an emergency team to develop a rehabilitation treatment plan needed to obtain Aquatic Conservation Strategy Objectives (FM-5).
- (3) Select treatments on the basis of on-site values, downstream values, soil erosion potential, probability of successful implementation, social and environmental considerations (including protection of native plant communities), and cost as compared to benefits.
- (4) Examples of emergency fire rehabilitation treatments are listed below. Other examples are listed in BLM Manual Handbook 9188-1.
  - ◆ Seed grasses or other vegetation as needed to provide a protective cover as quickly as possible, using native species whenever practicable;
  - ◆ Mulch with weed free straw or other suitable material;
  - ◆ Fertilize;
  - ◆ Place channel stabilization structures;
  - ◆ Construct waterbars on firelines;
  - ◆ Place log erosion barriers (contour-felled and anchored trees).

## D. Prescribed Fire

### 1. General Guidelines

**Objective:** To maintain long-term site productivity of soil.

**Practices:** (1) Evaluate the need for burning based on soils, plant community, hazard reduction objectives, site ecology and site preparation criteria. Burn under conditions when a light to moderate-intensity burn can be achieved (see Table F-6) except when ecosystem management objectives dictate achievement of a burn of higher intensity.

(2) Conditions outlined in the Soil Resource Protection section will be met.

**Table F-6. Guidelines for Levels of Burn Intensity**

Visual Characterization	Site-Specific Results	Proportional Area
Light Burn	Duff, crumbled wood or other woody debris is partly burned, logs not deeply charred.	Less than 2 percent is severely burned. Less than 15 percent is moderately burned.
Moderate burn	Duff, rotten wood, or other woody debris partially to mostly consumed; logs may be deeply charred but but mineral soil under the ash is not appreciably changed in color.	Less than 10 percent is severely burned. More than 15 percent is moderately burned.
Severe Burn	Top layer of mineral soil significantly changed in color, usually to reddish color; next 1/2 inch blackened from organic matter charring by heat conducted through top layer.	More than 10 percent is severely burned. More than 80 percent is moderately burned. Remainder is lightly burned.

### 2. Riparian Reserves

**Objective:** To maintain a healthy riparian zone and water quality by minimizing erosion levels within Riparian Reserves.

**Practices:** (1) Hand piling and burning will be the preferred fuel treatment within 100 feet of Riparian Reserves. Design prescribed fire projects to contribute to the attainment of Aquatic Conservation Strategy Objectives and to minimize disturbance of riparian ground cover and vegetation.

(2) When an Riparian Reserve is within a burn unit and conditions warrant, only low intensity fire will be prescribed within 100 feet of Riparian Reserves. No intentional ignition will occur within 50 feet of Riparian Reserves except where watershed, wildlife habitat or riparian-wetland enhancement is the objective. Fires will be allowed to "back into" Riparian Reserves as long as a primarily light intensity burn is maintained.

### 3. Firelines

**Objective:** *To minimize soil disturbance, soil compaction, soil erosion, and disturbance to Riparian Reserves.*

**Practices:** (1) Construct firelines by hand on all slopes greater than 35 percent.

(2) Utilize one-pass construction with a brush blade or one edge of a tractor blade to construct tractor firelines, or construct firelines by hand.

(3) Construct waterbars on tractor and hand firelines according to guidelines in the Timber Harvest section, under Waterbars.

(4) No machine constructed firelines in Riparian Reserves.

## Mining

**Objective:** *To protect surface and groundwater quality and to minimize disturbance to soils, streambanks and riparian habitat within constraints of Department of Interior, Bureau of Land Management surface mining regulations (43 Code of Federal Regulations 3809). Reclamation guidance can be found in the Draft BLM Reclamation Handbook H-3042-1.*

### A. General Guidelines—All Mining Operations

**Objective:** *To mitigate impacts resulting from disturbances associated with mining and minerals leasing activities, as appropriate, in addition to the guidelines listed below (B through E).*

**Practices:** (1) **Steep Slopes** The Authorized Officer will approve an engineering or reclamation plan prior to disturbance of slopes over 60 percent. This plan could encompass the following: restoration of site productivity, adequate control of surface runoff; protection on off-site areas from accelerated erosion, such as rilling, gullying, piping, and mass wasting; surface-disturbing activities would not be conducted during extended wet periods; construction would not be allowed when soils are frozen.

(2) **Topsoil** Strip, stockpile, and protect from erosion all productive topsoil (usually the top 12 to 18 inches) from all excavations for use in future reclamation. Remove topsoil before the establishment of mining waste dumps and tailings ponds if the waste material is to be left in place during reclamation. Do not mix subsoil with topsoil. Control erosion of stockpiles through appropriate construction design with mulching (using weed free mulch) and/or revegetation with native species. Whenever possible, do not store topsoil for extended periods (over two years). Protect topsoil removed from the site by applying it to the areas of disturbance outside the working area and reseed.

(3) **Seedbed Preparation** Soils should be ripped or disked to a depth of at least 6 inches in rocky areas and at least 12 inches in less rocky areas. Contours should be followed to limit erosion. All stockpiled settling pond fines, and then topsoil, are then spread evenly over the disturbed areas.

(4) **Roads and Trails** Use existing roads and trails as much as possible. Construct roads to standards outlined in the Roads section. In areas designated as closed to off-highway vehicle use, do not allow off-road use of vehicles or equipment without the approval of the Authorized Officer. After mining is completed, reclaim all new roads unless otherwise specified. Knock down or backfill high walls and cutbanks to blend with the surrounding landscape. Remove all culverts and cut back fill to the original channel. Rip the roadbed to a minimum depth of 12 inches and waterbar, seed, fertilize, and/or mulch as necessary.



- (5) **Drill Sites** Locate exploratory drill sites next to or on existing roads when possible. Install erosion control structures (berms, dikes, trenches, outslope fill) under qualified supervision and take all precautions necessary to ensure their stability. The minimum area required for construction will be graded and cleared. Use special design measures, on a case-by-case basis, for new cut and fill slopes where moderate to high erosion hazards exist.
- (6) **Wells** Recontour and rehabilitate all areas not needed for production on well pads following the drilling phase for each well. Recontouring means shaping the disturbed area so that it will blend with the surrounding lands and minimize the possibility of erosion. While in operation, and during periods of temporary shutdown, protect exposed ground surfaces susceptible to erosion by stabilization, seeding, mulching, or installation of water diversions and routine watering of dust producing surfaces. Case and cement wells placed in freshwater aquifers. Remove drainage structures and associated fill dirt to the extent necessary to pass expected flood flows when obliterating well pads. Where practicable, backfill excavations and reduce high walls. Prepare an adequate seedbed while recontouring. Rip or disc compacted soils, following the contour of the land.
- (7) **Settling Ponds** Line ponds to prevent groundwater contamination. Allow tailings and settling ponds to dry out. Remove the fines and spread them evenly over disturbed areas, unless they contain toxic materials, which would be disposed of accordingly. Spread topsoil evenly over the fines. Backfill and reclaim settling and tailings ponds, unless they are suitable for another purpose, such as wildlife habitat or recreation.

## **B. Riparian Reserves**

**Note:** Practices 1 through 4 apply to any proposed **locatable** mining operation, other than notice level or casual use, located in Riparian Reserves.

**Practices:** (1) Prepare a Plan of Operations, including a reclamation plan and reclamation bond for all mining operations in Riparian Reserves. Such plans and bonds will address the costs of removing facilities, equipment, and materials; recontouring of disturbed areas to an approved topography; isolating and neutralizing or removing toxic or potentially toxic material; salvaging and replacing topsoil; and revegetating to meet Aquatic Conservation Strategy objectives (MM-1).

(2) Locate structures, support facilities, and roads outside Riparian Reserves. Use existing roadways whenever possible. If no alternative to siting facilities in Riparian Reserves exists, locate in a way compatible with Aquatic Conservation Strategy objectives. Road construction will be kept to the minimum necessary for the approved mineral activity. Roads will be constructed and maintained to meet road management standards and to minimize damage to resources in Riparian Reserves. When a road is no longer required for mineral or land management activities, it will be reclaimed. In any case, access roads will be constructed consistent with 43 Code of Federal Regulations 3809 and acceptable road construction standards and will minimize damage to resources in Riparian Reserves (MM-2).

(3) Avoid locating solid and sanitary waste facilities in Riparian Reserves. If no alternative to locating mine waste (waste rock, spent ore, tailings) facilities in Riparian Reserves exists, if releases can be prevented, and if stability can be ensured, then:

- a. Analyze the waste material using the best conventional sampling methods and analytic techniques to determine its chemical and physical stability characteristics.
- b. Locate and design the waste facilities using best conventional techniques to ensure mass stability and prevent the release of acid or toxic materials. If the best conventional technology is not sufficient to prevent such releases and ensure stability over the long term, prohibit such facilities in Riparian Reserves.

- c. Reclaim waste facilities after operations to ensure chemical and physical stability and to meet Aquatic Conservation Strategy objectives.
  - d. Monitor waste and waste facilities after operations to ensure chemical and physical stability and to meet Aquatic Conservation Strategy objectives.
  - e. Require reclamation bonds adequate to ensure chemical and physical stability and to meet Aquatic Conservation Strategy objectives.
- (4) Where an existing operator is in noncompliance at the notice level (that is, causing unnecessary or undue degradation), require actions similar to those in (3) above to meet the Intent of 43 Code of Federal Regulations 3809 regulations.
  - (5) For future **leasable** mineral activity in Riparian Reserves, prohibit surface occupancy for oil, gas and geothermal exploration and development activities unless it can be demonstrated that impacts will be acceptable or can be mitigated so that the objectives of the Aquatic Conservation Strategy can be met. Where possible, adjust the stipulations in existing leases to eliminate impacts that retard or prevent the attainment of Aquatic Conservation Strategy objectives, consistent with existing lease terms and stipulations.
  - (6) Allow development of **salable** minerals, such as sand and gravel, within Riparian Reserves only if Aquatic Conservation Strategy objectives can be met.
  - (7) Develop mitigating measures to prevent water quality degradation and to comply with Executive Order 11190 for wetlands. Require mining activities including road construction to conform with best management practices listed in other sections to protect water quality.
  - (8) Develop inspection and monitoring requirements and include such requirements in exploration and mining plans and in leases or permits consistent with existing laws and regulations. Evaluate the results of inspection and monitoring to determine if modification of plans, leases and permits is needed to eliminate impacts that retard or prevent attainment of Aquatic Conservation Strategy objectives.

### C. Locatable Operations

- Practices:** (1) **Permits.** Require the claimant to obtain all required state and federal operating permits. When mining will be in or near bodies of water or sediment will be discharged, the Department of Environmental Quality will be contacted. It is the operator's responsibility to obtain any needed suction dredging, stream bed alteration, or water discharge permits required by the Department of Environmental Quality or other agencies. Copies of such permits will be provided to the Area Manager if a notice or plan of operations is filed.
- (2) **Suction Dredging.** Comply with seasonal restrictions on suction dredging identified in Oregon Guidelines for Timing of In-Water Work to Protect Fish and Wildlife Resources. A notice or plan of operations is required for any suction dredge operation where the dredge is equipped with a suction intake hose diameter of greater than four inches. A notice or plan of operations is also required for all suction dredge operations involving more than one dredge, regardless of size. The operator must have the applicable Department of Environmental Quality suction dredge permit prior to starting work, and a copy should be submitted to the Area Manager.
- (3) **Settling Ponds.** Settling ponds must be used to contain fines and any discharge into waters of the state must meet the Department of Environmental Quality standards. Locate, design, operate, and maintain sediment settling ponds in conformance with the Department of Environmental Quality requirements.



## **Appendix F - Best Management Practices**

- (4) **Stream Crossings.** Design, locate, and construct stream crossings in conformance with practices described under Location, Design, and Construction in the Roads section.
- (5) Use existing roads, skid trails, and stream crossings whenever possible.
- (6) **Roads.** Temporary roads are to be constructed to a minimum width and with minimum cuts and fills. All roads will be constructed so as not to negatively impact slope stability. Where resource conditions warrant, apply rock to roads constructed or reconstructed for vehicular access to the mining area. Provide adequate drainage for roads.
- (7) **Roads** Prior to the first wet season, rip, waterbar, seed with native species, mulch (weed free), and barricade according to BLM specifications all roads and trails constructed for exploratory purposes that are unnecessary for the mining operation.
- (8) **Roads** Construct waterbars and barricade on all natural surface roads and trails when an operation shuts down for the wet season.
- (9) Rip, waterbar, seed, mulch, and barricade all natural surface roads and trails when the operation terminates, unless otherwise directed by the Authorized Officer.
- (10) Construct a berm or trench between disturbed areas and water courses.
- (11) **Topsoil** All excavations should have all productive topsoil (usually the top 12 to 18 inches) first stripped, stockpiled, and then protected from erosion for use in future reclamation. This also includes removal of topsoil before the establishment of mining waste dumps and tailings ponds, if the waste material will be left in place during reclamation. Construct a berm or trench immediately downslope of the stockpile. Preserve and protect organic matter in the topsoil by establishing vegetation on stockpiled soils.
- (12) Stabilize and contour the area, replace topsoil and mulch (weed free), seed with native species, and plant the area with appropriate vegetation from local sources (if possible) when no further mining is contemplated.
- (13) Where appropriate, during the period from October 15 to May 15, contour and mulch disturbed areas that will not be mined for at least 30 days.
- (14) Confine operations to bench areas rather than allow encroachment into Riparian Reserves whenever possible.
- (15) Locate and maintain sanitation facilities in accordance with the Department of Environmental Quality regulations.

### **D. Leasable Operations**

**Practice:** Limit drill site construction and access through Riparian Reserves to established roadways unless the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.

### **E. Salable Operations**

**Practices:** (1) Locate rock material stockpile sites on stable ground.

- (2) Locate, design, construct, and close roads, landings, and crusher pads in accordance with the Roads section. Prior to abandonment, all material sites will be graded to conform with the surrounding topography. Oversize material that is not usable, and reject, will be placed in the bottom of the pit, graded, and then the pit floor and cutslopes covered with topsoil. Reseeding, if

necessary, will be done as prescribed by the Area Manager. Access roads no longer needed by the BLM will be abandoned and reclaimed.

- (3) All topsoil will be stockpiled or windrowed, as appropriate, for use in reclamation. These piles may need to be stabilized by seeding in order to minimize erosion during the winter months.

## Livestock Grazing

### A. General Guidelines

**Objective:** *To protect, maintain, or improve water quality, riparian-wetland areas and upland plant communities; to achieve properly functioning riparian ecosystems.*

- Practices:**
- (1) Monitor, evaluate and adjust grazing practices to eliminate impacts that retard or prevent attainment of Aquatic Conservation Strategy objectives. If adjusting practices is not effective, eliminate grazing in the area (GM-1).
  - (2) Consider fencing springs, seeps, and water developments to protect water quality and riparian ecosystems. Pipe overflow away from the developed source area to minimize contamination.
  - (3) Locate livestock water developments away from riparian and wetland areas. Conditions outlined in the Water Source Development and Use section will be met.
  - (4) Do not locate salting areas within ¼ mile of permanent water sources or in Riparian Reserves.
  - (5) Minimize construction of livestock trails. Construct trails with a minimum of disturbance to the soil surface. Waterbar as appropriate.
  - (6) Locate new livestock handling and/or management facilities (corrals, pens, or holding pastures) outside Riparian Reserves and on level ground where appropriate drainage can be achieved away from Riparian Reserves. For existing livestock handling facilities inside Riparian Reserves, ensure that Aquatic Conservation Strategy objectives are met. Where these objectives cannot be met, require relocation or removal of such facilities. Limit livestock trailing, bedding, watering, loading, and other handling efforts to those areas and times that will ensure Aquatic Conservation Strategy objectives are met. Provide for adequate collection and disposal of wastes (GM-2, GM-3).
  - (7) Monitor, evaluate, and adjust upland livestock management practices to meet resource objectives.
  - (8) Resolve management conflicts or concerns regarding water quality and/or watershed/riparian-wetland area condition through the development of grazing management plans. Modify current grazing management practices through allotment management plans, coordinated resource management plans, agreements or decisions, as needed.
  - (9) Promote ecological recovery through appropriate forage utilization levels, improved livestock distribution and management through fencing, vegetation treatments, water source development, and/or changes in season of use or livestock numbers.
  - (10) Range improvement projects will meet conditions outlined in the Soil Resource Protection section.
  - (11) Cooperate with federal, tribal, and state wildlife management agencies to identify and eliminate wild ungulate impacts that are inconsistent with attainment of Aquatic Conservation Strategy objectives.

## B. Grazing Management in Riparian-Wetland Areas

**Objective:** To achieve properly functioning riparian-wetland ecosystems.

- Practices:** (1) Conduct grazing management practices to provide for regrowth of riparian-wetland vegetation or leave sufficient vegetation after use for maintenance of proper functioning condition. See the Definitions and Proper Functioning Condition section for instructions on determining proper functioning condition.
- (2) Develop grazing strategies for riparian-wetland areas using one or more of the following features. This grazing strategy would be developed at the activity planning level, through an allotment evaluation and the development of an allotment management plan:
- ◆ inclusion of the riparian-wetland area within a separate pasture with separate management objectives and strategies;
  - ◆ fencing or herding of livestock out of riparian-wetland areas for as long as necessary to allow vegetation to recover;
  - ◆ controlling the timing of grazing to keep livestock off streambanks when they are most vulnerable to damage and to coincide with the physiological needs of target plant species;
  - ◆ adding more rest to the grazing cycle to increase plant vigor, allow streambanks to heal, or encourage more desirable plant species composition;
  - ◆ limiting grazing intensity to a level which will maintain desired species composition and vigor;
  - ◆ changing from cattle to sheep to obtain better animal distribution through herding;
  - ◆ permanently excluding livestock from those riparian-wetland areas that are at high risk and have poor recovery potential, and when there is no practical way to protect them while grazing adjacent uplands.
- (3) Incorporate allowable use guidelines for riparian-wetlands in allotment management plans as part of a grazing strategy. Allowable use of forage is based on the amount of forage that will be left at the end of the overall grazing season or the end of the growing season, whichever is later. These guidelines would generally follow the utilization standards shown in Table F-7, which include cumulative annual use by wild ungulates and livestock:

**Table F-7. Utilization Standards in Riparian-Wetland Areas.**

	Proper Functioning Condition		Functional - At Risk or Nonfunctioning	
	Herbaceous	Woody	Herbaceous	Woody
Riparian Areas with Management	50	50	0-40	0-35
Riparian Areas without Management	40	30	0-30	0-25

In addition to these allowable use guidelines, grazing would be scheduled to allow at least 30 days of post-grazing regrowth annually. The allotment management plans could include utilization standards which are either lower or higher than those outlined above, or could prescribe late season use of riparian vegetation. This prescription could occur when associated with intensive grazing systems and specific vegetation management objectives that meet the needs of riparian-dependent resources.

### C. GRAZING MANAGEMENT IN UPLAND AREAS

**Objective:** *To protect, maintain, or improve upland plant communities; to achieve properly functioning upland ecosystems.*

**Practices:** (1) Follow the Allowable Use Guidelines outlined in Table F-8 for uplands. These utilization objectives are designed to maintain soil productivity, plant vigor, and livestock and wildlife forage value.

**Table F-8. Degree of Allowable Use (by percentage).**

Plant Category	Spring	Summer	Fall	Season-long
Perennial grasses and grasslike	50	50	60	50
Perennial and biennial forbs	50	50	60	50
Shrubs, half shrubs and trees	30	50	50	45

For this table, spring is considered to be the period of active vegetative growth; summer is flowering, seed production, and some regrowth; fall is cured and late regrowth. These utilization levels are for the current year's growth, including regrowth. Guidelines for certain allotment or pastures may differ from these guidelines, due to specific resource concerns and site-specific conditions.

- (2) Manage uplands to provide for the following functions within site capabilities and consistent with other practices:
- ♦ the vegetation canopy allows moisture from typical storm events to reach the soil surface;
  - ♦ standing vegetation captures blowing or drifting snow;
  - ♦ organic material (plant litter, standing vegetation) protects the soil surface from raindrop impact;
  - ♦ coarse rock fragments protect the soil surface from raindrop impact;
  - ♦ water is not restricted from infiltrating the soil surface (for example, organic matter is present and no physical soil crusting, capping, or sealing of the surface is present);
  - ♦ subsurface soil conditions support infiltration rates (for example, compaction layers and evidence of frost heave are uncommon);
  - ♦ standing vegetation and plant litter detain overland flow and trap sediment;
  - ♦ surface roughness detains overland flow;
  - ♦ evidence of excessive overland flow (rills and gullies, pedestalling), wind erosion or other soil movement is uncommon;
  - ♦ plant cover and litter protect the soil surface from the evaporative effects of sun and wind;
  - ♦ plants are vigorous and productive and consist of desirable species.

## Watershed Rehabilitation

**Objective:** *To increase soil stability, reduce soil erosion, and improve water quality.*

- Practices:**
- (1) Design and implement watershed restoration projects in a manner that promotes long-term ecological integrity of ecosystems, conserves the genetic integrity of native species, and attains Aquatic Conservation Strategy Objectives. Employ good project planning using an interdisciplinary team. Recent BLM policy provides direction and guidance for the development of restoration projects, and should be incorporated (WR-1).
  - (2) Use corrective measures to repair degraded watershed conditions and rehabilitate with a native (where practicable) vegetative cover that will maintain or improve soil stability, reduce surface runoff, increase infiltration, and reduce flood occurrence and flood damages. Do not use mitigation or planned restoration as a substitute for preventing habitat degradation (WR-3).
  - (3) Consider partnerships or the use of cooperative agreements to coordinate efforts with adjacent landowners. Develop watershed-based Coordinated Resource Management Plans to meet Aquatic Conservation Strategy Objectives (WR-2).
  - (4) Where feasible, rehabilitate headcuts and gullies on watershed uplands.
  - (5) Improve native perennial grass cover conditions or wildlife habitat using treatment projects such as juniper control, brush control or prescribed fire. Design projects so that adequate soil cover remains (either by leaving cut trees in place for many years or by lopping and scattering branches); an adequate herbaceous seed source or seed bed is available (either naturally or through seeding); wildlife habitat is either maintained or enhanced; and ensure that subsequent management of the site addresses livestock and recreation use, or other management-caused limiting factors. Watershed Improvement projects are to be designed to meet the requirements of Section IV; however, in the short-term these conditions may be exceeded in order to achieve watershed improvement objectives.

## Fisheries Habitat Improvement Projects

**Objective:** *To minimize damage to streambanks and riparian habitat during construction of fishery habitat improvement projects.*

- Practices:**
- (1) Design and implement fish and wildlife habitat restoration and enhancement activities in a manner that contributes to attainment of Aquatic Conservation Strategy objectives (FW-1).
  - (2) Carefully plan access needs for individual work sites within a project area to minimize exposure of bare soil, compaction, and possible damage to tree roots. Utilize existing trails to the extent practical.
  - (3) Base design of habitat improvement structures on state-of-the-art techniques and local stream hydraulics.
  - (4) Confine work in the stream channels to between June 15 and September 15 (during the low flow period) to minimize the area of the stream that would be affected by sedimentation.
  - (5) Keep equipment out of streams to extent possible.



- (6) Limit the amount of streambank excavation to the minimum necessary to ensure stability of enhancement structures. Place excavated material as far above the high water mark as possible to avoid entry into the stream.
- (7) Whenever possible obtain logs for habitat improvement structures from outside the riparian zone or at least 200 feet from the stream channel to maintain integrity of riparian habitat and streambanks.
- (8) Inspect all mechanized equipment daily to help ensure toxic materials such as fuel and hydraulic fluid do not enter the stream.
- (9) Utilize waterbars, barricades, and seeding to stabilize bare soil areas.

## Recreation and Off-Highway Vehicle Use

**Objective:** *To minimize damage to streambanks and riparian habitat and impacts to water quality and soil productivity from off-highway vehicles and other recreation use.*

- Practices:**
- (1) Minimize resource damage from off-highway vehicle use. Where off-highway vehicle use is causing resource damage, restrict or prohibit such use. Prohibit vehicle and off-highway vehicle use (except for boats) in fish bearing and perennial streams, lakes, ponds and other waters, on sensitive stream banks, and, during wet soil conditions, in Riparian Reserves.
  - (2) Design, construct, and operate recreation facilities, including trails and dispersed sites, within Riparian Reserves in a manner that contributes to attainment of Aquatic Conservation Strategy Objectives. For existing recreation facilities inside Riparian Reserves, evaluate and mitigate impacts to ensure that these do not prevent, and to the extent practicable contribute to, attainment of Aquatic Conservation Strategy Objectives. Implement erosion control measures on all administrative sites and on developed recreation sites to stabilize the soil and minimize stream sedimentation (RM-1).
  - (3) Adjust dispersed and developed recreation practices that retard or prevent attainment of Aquatic Conservation Strategy Objectives. Where adjustment measures such as education, use limitations, traffic control devices, increased maintenance, relocation of facilities and/or specific site closures are not effective, eliminate the practice or occupancy (RM-2).
  - (4) Design facilities to concentrate and direct foot and vehicular traffic to reduce impacts. Apply site-hardening measures appropriate for the level of designed development. However, in areas with concentrated recreation use, requirements outlined in the Soil Resource Protection section may be exceeded, provided that State and Clean Water Act requirements are met.
  - (5) Design, construct and operate fish and wildlife interpretive and other user-enhancement facilities in a manner that does not retard or prevent attainment of Aquatic Conservation Strategy objectives. For existing fish and wildlife interpretive and other user-enhancement facilities inside Riparian Reserves, ensure that Aquatic Conservation Strategy objectives are met. Where Aquatic Conservation Strategy objectives cannot be met, relocate or close such facilities (FW-2).

**Objective:** *To provide safe drinking water to administrative facilities and recreation sites.*

- Practices:**
- (1) Environmental Protection Agency Drinking Water Standards and State and local Health Departments provide the standards and administrative guidelines for drinking water supplies. These agencies will be used as a source of information and technical assistance.

- (2) The District Engineer serves as the District Drinking Water Coordinator and is responsible for coordinating a testing program to ensure that tests are performed on water systems in accordance with applicable laws and regulations. The District Drinking Water Coordinator also prepares reports of test results for district water systems and maintains records of monitoring, treatment, and laboratory test results. Bureau-operated water systems are managed in accordance with BLM Manual 9184: Drinking Water Supply.

**Objective:** *To protect surface and subsurface water from bacteria, nutrients, and chemical pollutants resulting from the collection, transmission, treatment, and disposal of sewage and solid waste at administrative facilities and recreation sites.*

- Practices:** (1) The District Engineer is responsible for the day-to-day operation, monitoring and maintenance of wastewater treatment facilities, including septic systems and toilets at recreation facilities. Guidance for this program is outlined in BLM Manual 9182: Wastewater Treatment.
- (2) Plan, locate, design, construct, operate, inspect, and maintain sanitation facilities and refuse disposal sites to minimize the possibility of water contamination. Consult State and local authorities to assure compliance with all applicable State and local regulations. Educate the public in proper sanitation practices and refuse disposal at each site through the use of signs, printed information, mass media, and personal contact.

## Management of Competing Vegetation (Not Including Noxious Weeds): Use of Herbicides

**Objective:** *To protect water quality and public health and safety.*

- Practices:** (1) Herbicides, insecticides, and other toxicants, and other chemicals shall be applied only in a manner that avoids impacts that retard or prevent attainment of Aquatic Conservation Strategy objectives (RA-3).
- (2) Notify residents and adjacent landowners within 0.5 mile of proposed treatment sites who likely could be directly affected by chemical drift, smoke, food or water contamination, or an accidental spill prior to any chemical application.
- (3) Use the buffer strips widths in Table F-9 on perennial and fish bearing streams, and on all lakes, ponds and other waters:

**Table F-9. Application Technique.**

	<u>Minimum Buffer Width<sup>1</sup></u>
Manual wipe-on	High Water Mark
Manual	10 feet
Vehicle	50 feet
Aerial (Perennial and Fish Bearing Streams)	100 feet
Aerial (Lakes, ponds, and other waters)	200 feet
Aerial (In drainages with domestic water diversions)	200 feet

<sup>1</sup>All surface waters, unless otherwise indicated.



Local conditions may require an expansion of these minimum widths. Some examples of site-specific factors that may necessitate additional buffer widths include: mode of transport (direct application, drift, and water flow); adjacent topography; and buffer vegetation structure and functions.

- (3) Assign 100-200 foot buffers in areas having shallow water tables or where aquifers are located in alluvial deposits along major streams when using atrazine, a persistent chemical.

## Noxious Weed Control

**Objective:** To protect water quality, public health and safety, and soil productivity.

**Practices:** (1) Herbicides, insecticides, and other toxicants, and other chemicals shall be applied only in a manner that avoids impacts that retard or prevent attainment of Aquatic Conservation Strategy objectives (RA-3).

- (2) **Biological Control:** If grazing by goats or sheep is used, allowable use guidelines in Section XII may be exceeded in order to accomplish control or eradication objectives. Adherence to these guidelines will be analyzed on a site-specific, case-by-case basis.
- (3) **Manual/Mechanical Control:** Tillage will be allowed on slopes that do not exceed 10 percent. Controlled burning may be used if the burned area can be rehabilitated to prevent erosion and resource degradation. Guidelines in Section IV may be exceeded in order to accomplish control or eradication objectives. Adherence to these guidelines will be analyzed on a site-specific, case-by-case basis.
- (4) **Chemical Control:** Herbicides labeled for aquatic use in the control of riparian-wetland or aquatic weeds could be used as described in the *Northwest Area Noxious Weed Control Environmental Impact Statement* (1987). For all other herbicides, use the buffer strips widths in Table F-10 on perennial and fish bearing streams, and on all lakes, ponds and other waters:

**Table F-10. Application Technique.**

	Minimum Buffer Width <sup>1</sup>
Manual wipe-on	Existing High Water Line
Spot Treatment by Ground vehicle with handguns or with backpacks	10 feet
Granular Formations	10 feet
Ground Vehicle with Boom Sprayers	25 feet
Aerial (All surface waters and identified ground water recharge areas)	100 feet

<sup>1</sup>All surface waters.

Local conditions may require an expansion of these minimum widths. Some examples of site-specific factors that may necessitate additional buffer widths include: mode of transport (direct application, drift, and water flow); adjacent topography; and buffer vegetation structure and functions.

## Water Source Development and Use

**Objective:** To supply water for various resource programs while protecting water quality and riparian vegetation.

- Practices:**
- (1) Locate water drafting sites to minimize adverse effects on stream channel stability, sedimentation, and in-stream flows needed to maintain riparian resources, channel conditions, and aquatic habitat (RA-4).
  - (2) **Water Rights and Permits** All proposed water source developments will have appropriate water rights documentation completed prior to construction, in accordance with Oregon State water laws. The District Engineer will be consulted during the planning process for proposed developments in order to initiate filing for permits and water rights documentation.
  - (3) Design and construct durable, long-term water sources. Avoid reduction of downstream flow which would detrimentally affect aquatic resources, fish passage, or other uses.
  - (4) Direct overflow from water-holding developments back into the stream.
  - (5) Locate road approaches to instream water source developments so as to minimize potential impacts in riparian-wetland areas. Apply rock to surface of these approaches to reduce the effects of sediment washing into the stream.
  - (6) Avoid use of road fills for water impoundment dams unless specifically designed for that purpose. Remove any blocking device prior to fall rains.
  - (7) Construct water sources during the dry season (generally between May 15 and October 15).
  - (8) Standards and guidelines for water developments are outlined in BLM Manual Handbook 1741-2, *Water Developments*.
  - (9) **Use of Existing Developments** Use of water in existing developments must be in accordance with the allowed use of that water as stated in the water right for that development. Any use, except for emergency fire suppression, that is outside of the permitted amounts or type of use (as specified by a Certificate of Water Right) must be covered under a **Limited License to Use Surface Water, which is issued by the State**. The District Engineer will be consulted prior to the anticipated need for the use of water to determine if the proposed use is in accordance with water rights. If not, then an application for a Limited License to Use Surface Water will be filed by the District Engineer.

## Erosion Control Practices

See BLM Manual Handbook 9188-1.

## Definitions and Proper Functioning Condition

### Definitions

**Wetland:** Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support and which, under normal circumstances, do support a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands include marshes, shallow swamps, lake bogs, muskegs, wet meadows, estuaries, and riparian areas. (33 Code of Federal Regulations 323)

**Riparian Area:** A form of wetland transition between permanently saturated wetlands and upland areas. These areas exhibit vegetation of physical characteristics reflective of permanent surface or subsurface water influence. Lands along, adjacent to, or contiguous with perennially and intermittently flowing rivers and streams, glacial potholes, and the shores of lakes and reservoirs with stable water levels are typical riparian areas. Excluded are such sites as ephemeral streams or washes that do not exhibit the presence of vegetation dependent upon free water in the soil.

**Lotic:** Characterized by running water habitat, as in rivers, streams and springs.

**Lentic:** Characterized by standing water habitat, as in lakes, ponds, seeps, bogs and wet meadows.

**Perennial Stream:** A stream that typically has running water on a year-round basis.

**Intermittent Stream:** Any non-permanently flowing drainage feature having a definable channel and evidence of annual scour or deposition. This includes what are sometimes referred to as ephemeral streams if they meet these two physical criteria. As a guideline, an intermittent stream will flow at least 30 days every six out of 10 years.

Many intermittent streams may be used as spawning and rearing streams, refuge areas during flood events in larger rivers and streams, or travel routes for fish emigrating from lakes. In these instances, the standards and guidelines for fish-bearing streams would apply to those sections of the intermittent used by any species of fish for any duration.

**Detrimental Compaction:** Detrimental soil compaction occurs at depths greater than two inches and is evidenced by: an increase in soil bulk density of 15 percent or more over the undisturbed level; and/or a macropore space (pores over 0.038 millimeters) reduction of 50 percent or more.

## Determination of Riparian-Wetland Area Condition

Recent Bureau of Land Management, Oregon State Office guidance states that during inventory and monitoring of riparian areas, an assessment of riparian-wetland area status in terms of functioning and ecological condition should be incorporated. This information should be included in allotment management plans and other planning documents. Current condition of riparian-wetland areas is placed into one of the following functional categories.

**Proper Functioning Condition:** Riparian-wetland areas are functioning properly when adequate vegetation, landform, or large woody debris are present to dissipate stream energy associated with high water flows, thereby reducing erosion and improving water quality; filter sediment, capture bedload and aid floodplain development; improve floodwater retention and groundwater recharge; develop root masses that stabilize streambanks against cutting action; develop diverse ponding and channel characteristics to provide the habitat and the water depth, duration and temperature necessary for fish production, waterfowl breeding, and other uses; and support greater biodiversity. The functioning condition of riparian-wetland areas is a result of the interaction among geology, soil, water and vegetation.

**Functional-At Risk:** Riparian-wetland areas that are in functional condition but an existing soil, water, management or vegetation attribute makes it susceptible to degradation.

**Non-Functional:** Riparian-wetland areas that clearly are not providing adequate vegetation, landform, or large woody debris to dissipate stream energy associated with high flows, and thus are not reducing erosion, improving water quality, etc., as listed above. The absence of certain physical attributes, such as having a floodplain where one should be, are indicators of non-functioning conditions.

Along with functioning condition, BLM expresses the status of riparian-wetland areas in ecological terms. In many cases, riparian-wetland areas will provide functional benefits if they are in the late seral to potential plant community stage. Therefore, BLM has the general goal of achieving advanced ecological status in riparian-wetland areas, except where resource management objectives would require an earlier successional stage. For

## **Appendix F - Best Management Practices**

example, vegetation diversity may not occur at the potential plant community stage. Through site-specific activity plans, determine the most desirable riparian-wetland community for meeting management objectives.

A Technical Reference 1737-9, *Process for Assessing Proper Functioning Condition*, discusses how to assess condition and gives the following guidelines for determining desired future condition:

1. Determine existing condition.
2. Determine potential condition.
3. Determine the minimum conditions to reach proper functioning condition.
4. Determine management goals for the watershed (that is Desired Plant Community or Desired Future Condition).
5. Negotiate specific objectives to reach management goals.
6. Design management actions.
7. Determine monitoring needs.
8. Provide enough flexibility to change management actions based upon monitoring results.

The amount of time spent in these steps would depend on the riparian and riparian-dependent resources involved, and what kinds of information are available. When possible, Ecological Site Inventory information should be gathered on certain riparian areas in order to make judgements. Otherwise, use existing inventory and monitoring information and professional, interdisciplinary judgement.

## **Riparian-Wetland Reference Tools**

The BLM has developed a series of handbooks to assist in the management of riparian-wetland areas, and are listed below.

Technical Reference TR-1737-1: *A Selected, Annotated Bibliography of Riparian Area Management*

Technical Reference TR-1737-2: *The Use of Aerial Photography to Inventory and Monitor Riparian Areas*

Technical Reference TR-1737-3: *Inventory and Monitoring of Riparian Areas*

Technical Reference TR-1737-4: *Grazing Management in Riparian Areas*

Technical Reference TR-1737-5: *Riparian and Wetland Classification Review*

Technical Reference TR-1737-6: *Management Techniques in Riparian Areas*

Technical Reference TR-1737-7: *Procedures for Ecological Site Inventory- With Special Reference to Riparian-Wetland Sites*

Technical Reference TR-1737-8: *Greenline Riparian-Wetland Monitoring*

Technical Reference TR-1737-9: *Procedures for Assessing Proper Functioning Condition*

**Table F-3. Guide for Placing Common Soil and Geologic types into Soil Erosion and Soil Infiltration Classes to Space Lateral Road Drainage Culverts**

Representative Soil Series type	721	729	380	719	706	718	381			
Erosion Class	I	II	III	IV	V	VI	VII	VIII	IX	X
Erosion Index	10	20	30	40	50	60	70	80	90	100
Standard Soil Textures and Unified System Soil Groups	SM	SM	Silt (unconsolidated) (B)	Silt (consolidated) (B)	Silty clay loam (A)	Clay loam (A)	Loamy sand (C)	Coarse sand (C)	Fine gravel	Rock (C)
	ML	ML	OL	OL	Silty clay (A)	Silt loam (A,B)	Sandy loam (B)	SW	SW	Cobble (C)
			MH	MH	Clay, varying with type, cohesiveness & compaction (A)	Clay, varying with type, cohesiveness & compaction (A)		SP	SP	Gravel (C)
				CL	Sandy clay (B)	Sandy clay loam (B)	Sand (B,C)	Sand (B,C)		GW,GP
Special Cases: General Names & Descriptions					SC,GM OH,CH	CH,GM	GC			
	Decomposed grandiorite (C)	Decomposed sandstone, e.g., (B,C)	Fine soils derived from rocks high in mica (C)	Coarse soils derived from rocks high in mica (C)	Some volcanic ash or extremely fine pumice sometimes difficult to distinguish from residual soils (B)					Fractured loose basalt or shale (C)
	High decomposed granite (B)	Greasy decomposed rock high in clay (A)								"Shot" as found in Coarse volcanic cinders (C)
			Pumice, varying with location, particle size, density, topography, and compaction (B,C)							Bed rock (A)

Table F-4. Guide for Maximum Spacing (in feet) of Lateral Drainage Culverts by Soil Erosion Classes and Road Grade (2 percent to 18 percent)

Road Grade In Percent	Erosion Class Erosion Index	I 10	II 20	III 30	IV 40	V 50	VI 60	VII 70	VIII 80	IX 90	X 100
2		900	1225								
3		600	815	1070	1205						
4		450	610	800	905	1015					
5		360	490	640	725	810	865	1000			
6		300	410	535	605	675	720	835	1010		
7		255	350	455	515	580	620	715	865	1030	1210
8		225	305	400	450	505	540	625	755	900	1055
9		200	270	355	400	450	480	555	670	800	940
10		180	245	320	360	405	435	500	605	720	845
11		165	220	290	330	370	395	455	550	655	770
12		150	205	265	305	340	360	415	505	600	705
13		140	190	245	280	310	335	385	465	555	650
14		130	175	230	260	290	310	355	430	515	605
15		120	165	215	240	270	300	335	405	480	565
16		115	155	200	225	255	280	310	380	450	530
17		105	145	190	215	240	265	295	355	424	500
18		100	135	180	200	225	250	280	335	400	470
19 to 40	Jeep Roads Skid Roads	50	50	50	90	90	90	90	90	90	90

This table is based on rainfall intensities of 1 to 2 inches per hour falling in a 15-minute period with an expected recurrence interval of 25 years. For areas having intensities other than 1 to 2 inches per hour, divide values in the table as follows:

Rainfall Intensity	Divisor
2-3 inches per hour	1.50
3-4 inches per hour	1.75
4-5 inches per hour	2.00
Less than 1 inch per hour	Whatever the intensity (.75, .85, etc.)

Ref: Transportation Engineering Handbook, U.S. Forest Service, R-6, 1966.

Notes: In soils producing high sediment yields such as the 721, 729, and 300 series, the spacings shown should be considered as maximum distances between drainage structures. 300 feet to 400 feet to gradients of 4 to 10 percent in these soils was found to be the average spacing that provided fair ditchline protection.



# Appendix G

## Timber Management

### Introduction

This appendix consists of three parts. The first part describes the silvicultural systems used in the design of the proposed action. Part two describes the objectives, habitat criteria, and management practices design for the land use allocations. Finally, the third section describes forest genetics program.

### Silvicultural Systems Utilized in the Design of the Proposed Action

In addition to dealing with land use allocations and objectives, the resource management plan deals with the selection of and effects of different silvicultural systems and the practices used to carry out those systems.

Silvicultural systems define the sequence of management treatments that take place throughout the entire lives of forest stands that are conducted to meet management objectives. Systems are designed to move stands from their current condition along a developmental path toward a desired or target stand condition. Reforestation or the establishment of desired vegetation is the critical part of any silvicultural system.

In the design of the proposed action, a variety of general silvicultural systems are used for the different Land Use Allocations. Differences between systems are the result of differences in resource objectives and differences in forest condition and ecological types. Silvicultural systems are resource and objective neutral. They are designed to meet a wide range of management goals that include timber production, creation or maintenance of wildlife habitat, restoration of forest condition (health), restoration or improvement of riparian condition, and maintenance of site productivity. The description of silvicultural systems, therefore, is not included with any one resource category.

### Modified Even-Aged Silvicultural Systems

Modified even-aged systems involve the management of both existing even-aged or near even-aged stands and the creation of new even-aged stands through harvesting while retaining both living and dead structural elements (green trees, snags, coarse woody debris). Retained structure is at levels below those detailed for structural retention systems.

### Stand Regeneration

Stand regeneration methods under even-aged silvicultural systems include modified versions of the clear-cutting, seed tree, shelterwood, and overstory removal harvest methods.

Modified clear-cutting harvests the majority of the stand in a single entry. It permits the establishment of an even-aged stand with the fewest number of entries while retaining wildlife trees and snags. Regeneration is usually through planting following site preparation, although in southern Oregon there are sometimes significant quantities of advanced regeneration remaining after logging. Natural regeneration may occur through seed dispersed from retained trees or trees in adjacent timber stands. In southern Oregon, units harvested in this manner could require actions in addition to conifer planting to secure regeneration. These practices include seedling shading, protection from animal damage, and control of competing vegetation.



## *Appendix G - Silvicultural Systems Utilized in the Design of the Proposed Action*

The seed tree method of harvest removes the majority of a stand in a single entry except for a small number (usually 3-10 trees per acre) of green, seed trees that are retained (in addition to desired green-trees and snags) to provide seed for natural regeneration. If necessary, artificial regeneration, usually planting, would be used to reach target stocking levels. Genetically-selected stock would be used when available. Seed trees are removed when the unit is judged to be stocked with regeneration.

In a shelterwood system, a stand is harvested in a series of two or more partial cut entries designed to create the necessary level of disturbance and to provide shelter for the establishment of newly planted and natural seedlings. After establishment of regeneration, overstory trees that are in addition to designated wildlife trees and snags would be removed. While shelterwood units are typically planted with conifer species, natural regeneration may constitute a large percentage of the regeneration present.

Forest stands in southern Oregon are often multiple-aged with different canopy levels resulting from past natural stand disturbances such as under-canopy fires or from past partial cut harvesting. In these stands an understory canopy level often exists and is capable of being released. This understory canopy level may consist of seedlings, saplings, or young merchantable timber. The release and subsequent management of the understory canopy could result in a yield increase when compared to growing a new stand after a more complete stand removal. The decision to remove an overstory canopy considers the releasability and species composition of the understory canopy and logging feasibility. In some cases, retention of understory species could result in an undesirable seral shift, a higher level of disease in stands, and a potential loss of stand health.

### **Stand Management**

Following the regeneration phase, modified even-aged systems are subjected to treatments designed to produce desired stand conditions that include wood of desired quality, quantity, and value. Modified even-aged systems may be managed at different levels of intensity.

Stand management practice include control of species composition and stand density. Release practices are employed to ensure tree growth is not slowed by competing, undesirable plants and that desired trees are not displaced. Density control through thinning assures that cubic foot volume growth is concentrated in the stems of selected trees.

On higher sites, forest fertilization may be employed to temporarily increase stand growth. Some young stands in the planning area are in poor condition because of high densities or because of overstory competition. Stands may experience significant growth retardation called thinning shock following precommercial thinning, overstory removal, or release. The severity of this retardation may be reduced through the application of fertilizer. Forest fertilization may also be used to improve tree vigor and to reduce insect and drought related mortality.

### **Stand Harvesting**

Stand harvesting may occur at any age above a minimum harvest age set to meet land use objectives as well as economic and logging-practicality requirements.

The sustainable harvest level is highest if minimum harvest age is set at the lowest practical age. Over time, however, rotation lengths would approach the age of culmination of mean annual increment. Culmination of mean annual increment varies with site quality, the kinds of silvicultural practices employed, and the timing of those practices. For most regimes and sites in southwestern Oregon, culmination of mean annual increment occurs near 100 years of age.

To achieve higher wood quality, larger log sizes, or to produce habitat for species that live in later seral stages, minimum harvest age may be set at an older age.

## Shelterwood Retention Silvicultural Systems

Shelterwood retention refers to even-aged systems that have sometimes been termed "irregular shelterwoods." In these systems, overstory trees are retained until understory conifers are large enough to fulfill management objectives such as preserving visual qualities, surviving growing-season frosts, or protecting sensitive soils. Depending upon objectives, overstory trees may be retained for 15 to 30 years. A wide variety of stand conditions exist across the planning area. In some areas such as those infected with diseases or root rot and those of high blowdown hazard, retention of an overstory may not be successful.

### Stand Regeneration

Shelterwood retention units are normally planted, but like shelterwoods, also receive varying amounts of natural regeneration. Planting stock would reflect genetic selection when such stock is available, but since the performance of genetic stock and percent representation in stands created under these regimes are uncertain, no yield gain would be claimed for this action.

### Stand Management

Like other silvicultural systems, shelterwood retention stands receive treatments designed to produce desired stand characteristics. To produce economically-harvestable tree sizes in reasonable periods of time, control of species composition and stand density are as critical or more critical in shelterwood retention systems than in modified even-aged systems. Following the removal harvest, fertilization may be applied to accelerate stand development and to reduce the shock and damage of overstory removal.

### Stand Harvesting

Harvest of retained shelterwood trees (in excess of desired green-trees and snags) occurs in one or more entries 15 to 30 years after the regeneration harvest and when stand development has reached a point where visual, frost-tolerance or soil requirements are met.

## Structural Retention Systems

These silvicultural systems are designed primarily to retain or to recreate forest ecosystems that resemble natural systems in composition, structure, and in ecosystem function. Retained structural components include green-trees, snags, and coarse woody debris that may be clumped or distributed in various ways across the landscape. Through retention and re-creation of structure and through appropriate selection and timing of treatments, these systems attempt to retain natural ecosystem processes and habitat niches.

Structural retention systems attempt to provide for maintenance of site productivity, wildlife habitat, and a high level of biological diversity in a managed landscape. Silvicultural practices used are modifications of those used in modified even-aged systems and reflect attempts to redirect ecosystem processes rather than to replace those processes with agricultural-style management.

Structural retention systems would usually produce a multiple-canopied, multiple-aged stand but not an all-aged stand. Such stands are irregular uneven-aged stands, since they have several age classes, but not the more balanced age class distribution of stands with many age classes. Uneven-aged management of these stands would involve the selective harvest of individual trees (individual tree selection), or groups of trees (group selection), or small patch cuts to regenerate light-intolerant species. Under selective harvest, trees in all size classes would be eligible for thinning in order to reduce stocking to site capacity. The objective of structural retention and uneven-aged systems is to produce a multiple-canopied forest, but not necessarily one with all age classes present.

## **Stand Regeneration**

The regeneration phase of this system relies upon the use of both natural and planted conifer seedlings, together with subsequent stand management, to achieve a near-natural mixture of species in each seral stage. Genetically-selected stock, when available, would be combined with regular stock. No yield increase for use of selected stock would be projected.

## **Stand Management**

Stands created under this system receive treatments designed to meet structural, functional, and growth objectives. Density management would be used. Forest fertilization would be used as appropriate, but because of the uncertainty of its effect on diverse stands, it would not result in a projected yield increase. Underburning would be done to reintroduce fire as a natural process, reduce fuel loads to natural levels, and exclude species that would not be present under natural conditions.

## **Stand Harvesting**

Structural retention systems seek to retain or re-create habitat characteristics of older forests. Harvesting is expected to occur across stands and in group selections of varying sizes and patch cuts up to 3 acres in size with structures retained in the groups.

## **Salvage of Mortality Volume**

All silvicultural systems provide for salvage under prescriptions designed to ensure that such actions meet the requirements of the allocation.

Mortality in established stands results either from competition and self-thinning or from disturbance events such as fire, windstorms, or insect attack. Mortality associated with competition is generally harvested in commercial thinnings or is prevented through density management and species selection practices. Mortality of entire stands or of scattered trees that results from disturbance would be harvested in salvage operations. Only mortality above the level needed to meet snag retention and other habitat requirements and provide desired levels of coarse woody debris would be harvested.

## **Silvicultural Practices**

For each silvicultural system a variety of practices, other than harvesting, may be planned for specific periods in the life of the stand. These practices act to keep forest stands on desired developmental trajectories, speed the development of desired habitat components, and maintain or improve stand vigor. Silvicultural practices in this region have traditionally been applied to conifers stands and their development, however, many of the same principles and treatments have application for the growth and development of other desired vegetation.

While both the types of practices used and timing vary between systems, most silvicultural systems require the full range of forest management tools and practices for their successful implementation. To predictably direct forest stands (ecosystems) so that structural and other objectives are met may require some level of intensive stand tending practices whatever the system employed.

## **Site Preparation**

If needed, site preparation procedures would be used to prepare newly harvested or inadequately stocked areas for planting, seeding, or natural regeneration. Site preparation methods would be selected to: provide physical access to planting sites; control fire hazard; provide initial physical control of the site to channel limited resources on the site into desired vegetation; influence the plant community that redevelops on the site; influence or control animal populations; and ensure the retention of site productivity.

Within the planning area, four types of site preparation techniques would be used. These are prescribed burning, mechanical and manual methods, and herbicide application.

Prescribed burning, including broadcast and pile burns, is expected to be the primary method of site preparation. To protect air quality, burning would occur under conditions consistent with the Oregon Smoke Management Plan. Broadcast burning prescriptions will be written to minimize the detrimental effects of fire on other resources. Emphasis will be placed on protecting soils properties and the retention of coarse woody debris. Prescribed fire on sensitive soils will be designed to result in low to moderate intensity burns.

Mechanical site preparation consists of either: tractor piling or windrowing of slash and unwanted vegetation; or the use of a low ground pressure backhoe, loader, grapple, or other special equipment to move or pile slash and unwanted vegetation.

Manual site preparation consists of shrub pulling or cutting and hoeing or grubbing of unwanted vegetation and slash.

Application of herbicides for site preparation purposes would occur only after careful site-specific environmental analysis and local public involvement. Decision for use would be governed by the procedures established in BLM's Record of Decision Western Oregon Program-Management of Competing Vegetation (see Appendix 1-D of the draft Resource Management Plan for key sections of the Record of Decision).

## **Reforestation/Establishment of Non-Conifer Plant Species**

Conifer planting would be done where appropriate to assure that reforestation objectives are promptly met. The production of planting stock requires seed (cone) collection from wild stands and/or from seed orchards and the production of planting stock in bare-root nurseries or container shadehouses.

The release and management of existing natural regeneration has the potential to speed stand development. Natural regeneration can, in many situations, be both adequate and relatively prompt (Lewis, Park and Tuttle 1991) and of appropriate species (Williamson 1973). A result of relying on natural regeneration is the loss of the ability to use genetically-selected stock. When applicable, silvicultural systems would utilize existing regeneration, natural seeding, and prompt planting of desired species to assure that regeneration targets and timeframes are met. Within this plan no yield increase was assumed as a result of retention of existing regeneration following regeneration harvest or overstory removal.

Existing vegetation would be used to the extent possible in meeting management objectives dependant upon non-conifer vegetation. Where necessary to meet objectives, non-conifer vegetation would be established through seeding or the planting of bare-root or containerized plants.

## **Stand Protection**

Stand protection procedures would be designed to protect newly planted conifer seedlings and in some cases natural seedlings from natural hazards. Treatments include protecting seedlings from the sun by shading or bud capping or placing plastic tubes or netting over seedlings to protect from animal browsing or clipping. Control measures to deal with populations of animals such as mountain beaver, gophers, or porcupines would be initiated if populations of these animals reached levels high enough to threaten stands. Treatment acres will be determined annually in conjunction with reforestation surveys.

Similar treatments would be used when appropriate to protect planted or seeded non-conifer vegetation.

Stands will also be managed to decrease the risk of destruction by wildfire. Management practices include treatments such as underburning, limbing, density management, or hand piling or utilization of slash. Creation of fuel breaks, especially in Rural Interface Areas, would be a method of decreasing risks. Retention of a hardwood component in stands may result in somewhat higher level of resistance to low intensity fires.



## **Stand Maintenance**

Maintenance treatments occur after planting or seeding and are designed to promote the survival and establishment of conifers and other vegetation by reducing competition from undesired plant species. Maintenance and other vegetation management actions would be planned to meet species diversity goals.

Maintenance actions involve the implementation of preventive or ecosystem-based strategies or direct control actions using techniques such as mulching, cutting or pulling of unwanted species, grazing, or herbicide application. As with other vegetation management treatments, preference for stand maintenance treatments would be given to strategies that redirect natural ecosystem processes where practical and where scientific knowledge was adequate to support such strategies. The choice between methods would be made under the same decision framework listed for site preparation.

## **Pre-commercial Thinning (Density Management) and Release**

Precommercial thinning and release treatments would be designed to control stand density, influence species dominance, maintain stand vigor, and place stands on developmental paths so that desired stand characteristics result in the future. Thinning and release may occur simultaneously or separately.

Precommercial thinning and release treatments may be done either by manual methods such as falling and girdling or through herbicide application. Site specific decision-making processes for herbicide release treatments follow the same procedures as those listed for site preparation.

## **Commercial Thinning (Density Management)**

Commercial thinnings would be designed to control stand density, maintain stand vigor, and place or maintain stands on developmental paths so that desired stand characteristics result in the future. Commercial thinnings are scheduled after developing stands reach a combination of stem diameter and surplus volume to permit an entry that is economical. Commercial thinning may be effective in increasing recoverable timber production and in meeting structural diversity objectives in stands as old as 150 years (Williamson and Price 1971) (Williamson 1982). Heavy commercial thinning shows the ability to accelerate the development of old growth characteristics in even-aged stands (Newton and Cole 1987).

## **Fertilization**

Stand growth is limited by the supply of available nutrients, particularly by available nitrogen. The supply of soil nutrients would be conserved through design of management actions and could be augmented through either fertilization or in some situations, through retention of species and structural diversity in stands. Fertilization practices are designed based on extensive research, including work in southwestern Oregon. Fertilization actions are usually designed to apply 200 pounds of available nitrogen with helicopters in the form of urea-based prill (46 percent available nitrogen). Occasionally, fertilizer may be applied in a liquid urea-ammonia form or with a mixture of other nutrient elements in addition to nitrogen. Hand application is usually impractical. Forest fertilization actions would be sequenced with thinning actions with preference given to young even-aged stands of site four and higher in the next decade.

Fertilization has the effect of accelerating stand and seral development. Since fertilizer increases the rate tree canopies expand and increases tree vigor, it has been observed to reduce thinning shock, accelerate release, and reduce susceptibility to damage from insect and drought.

## **Pruning**

Pruning of young stands is carried out to increase wood quality through the production of clear wood on rotations shorter than would be required without the action. Pruning helps to avoid production of wood with loose knots and yielding lumber, which is tight-knotted but not necessarily clear. It is mandatory for the production of clear wood with grades above "common" under normal, even-aged rotations for Douglas-fir and pine (see Appendix W).

Pruning appears to be necessary to produce wood of acceptable quality from stands that are managed at very low densities to meet biological diversity objectives since trees in such stands would have long crowns and would produce wood with large knots without the action.

## Forest Condition Restoration Treatments

Forest condition restoration treatments are silvicultural treatments that are intended to reduce mortality and to restore the vigor, resiliency, and stability of forest stands that is necessary to achieve resource management objectives. These treatments include:

**Restoration thinning:** Reduction of the density of forest stands with the objective(s) of increasing stand vigor, reducing mortality of desired stand components, and/or reducing susceptibility to insect and disease attack and spread.

**Understory reduction:** Partial or complete removal of one or more understory canopy layers for the purpose(s) of reducing competition for desired stand components and/or reducing the risk of stand replacement fire.

**Restoration underburning:** Use of fire for the specific purpose of reducing mortality of desired trees and improving stand vigor, resiliency, and stability. Hazard reduction is an incidental benefit.

**Plant community restoration:** Silvicultural actions (including planting, maintenance, and stand tending) designed to establish and maintain desired species (including grasses, herbs, and shrubs) within forest stands and to prevent the introduction of noxious weeds.

**Restoration fertilization:** Fertilization of forest stands, with nitrogen or with micronutrients, designed to minimize thinning shock after restoration thinning, to improve stand vigor, and/or to increase resistance to insect attack.

## Silvicultural System Design

Silvicultural systems as well as individual management actions will be designed to:

- ◆ meet established land use objectives,
- ◆ maintain the health and sustainability of forest ecosystems and their processes or to restore forest condition so that management objectives can be met,
- ◆ incorporate current and developing knowledge of natural processes and the relationships between structures, landscape arrangements, and the maintenance of ecosystem function,
- ◆ involve landscape level (watershed) analysis at a variety of spatial and temporal scales, and
- ◆ consider the elements of ecosystem and landscape function, composition, and structure.

Silvicultural system design will vary from site to site and will be based on:

- ◆ consideration of stand vigor, disease, live crown ratio, and general stand condition,
- ◆ the autecological and synecological requirements of major or indicator plant and animal species and species groups,
- ◆ habitat requirements of rare or endangered species,
- ◆ requirements of avoidance strategies for vegetation management,
- ◆ economic feasibility, and

- ♦ soil, slope, aspect, and other physical site conditions that influence reforestation potential, blowdown potential, or that otherwise influence the ability of prescribed treatments to meet target stand and landscape objectives.

Simply stated, silvicultural systems and actions should be based on the objectives of the Land Allocation, ecological processes, site and stand characteristics, and economic feasibility within a framework of landscape analysis.

Best management practices for soil and water resources (see Appendix F) would be used in designing site-specific silvicultural prescriptions consistent with the objectives of the land use allocation.

Where appropriate, silvicultural systems and individual management actions will be adapted to meet the requirements of experimental designs that permit the agency and its publics to explore the results of the application of a range of alternative management options to both stands and landscapes. Where not in direct conflict with land use allocation objectives, silvicultural systems would be designed to assure that resultant wood quality is suitable for the range of current and forecasted uses and that they would maintain or enhance log value.

## Objectives, Habitat Criteria, and Management Practices Design for the Land Use Allocations

The description of the proposed action involves three separate criteria for each Land Use Allocation. These criteria are: A) resource condition objectives that summarize and highlight the important resource management goals for the land use allocation for the next decade; B) stand and landscape condition objectives that are desired in the near future and in the longer run; and C) management direction, which set sideboards and stands for stand and landscape composition.

Management direction described in this appendix incorporates *Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl*.

### Matrix

The general prescription would involve management within strategies and with levels of green tree retention that would both mimic natural ecological processes and meet species diversity, structural diversity, and landscape diversity objectives. In most cases, the general prescription would be one of structural retention. Modified even-aged and shelterwood retention systems would be utilized dependant upon factors such as site quality, growing season frosts, sensitive soils, presence of disease and visuals. Silvicultural practices include the full range of practices consistent with land use allocation objectives.

#### A. Resource Condition Objectives

1. Commodity Production: Suitable commercial forest land would be managed to assure a moderately high level of sustained timber productivity.
2. Forest Condition (Forest Health): Achievement of management objectives, including sustainability of both commodity production and wildlife habitat, requires that management emphasis be placed on treatments and harvests that restore stand condition and ecosystem productivity. Management actions include density management and understory reduction operations that reduce competition, increased use of understory prescribed fire, and fertilization. Removal of biomass from the understories of stands in the Pine series to restore stand health, reduce overstory mortality, and restore habitat productivity may be a below cost operation on many sites.



3. **Habitat Retention, Restoration, and Production:** Manage for minimal loss (including loss from wildfire) and long-term recovery of intact forest habitat over 150 years of age and toward an increase in the amount of spotted owl reproductive habitat. Selection of stands for management will involve consideration of the desired blend of seral stages and stand densities. Manage landscape planning blocks to maintain desired levels and distribution of early seral vegetation. Manage to retain a minimum of 40% canopy cover at the stand level in most regeneration harvest units except for units of the pine series or where stand condition or site characteristics require lower levels.

## **B. Stand and Landscape Condition Objectives**

1. **Target Stand Conditions:** Manage forests of the land use allocation so that over time landscapes would trend toward a forest composed of stands containing a variety of structures, stands containing trees of varying age and size, and stands with an assortment of canopy configurations. As stands age, within stand conditions should trend toward those characteristic of older forest types. Manage to provide for connectivity. Consistent with operational and logging practicality, retain fine-grained patterns.
2. **Seral Composition:** Over time, manage for a balance of seral stages consistent with land use allocation objectives.
3. **Landscape Composition:** Manage toward a mix of stand conditions and seral patterns with consideration to three levels of scale: physiographic province (river basin / mountain range), landscape block (watershed), and within stand detail. Manage treatment unit shapes and sizes to mimic natural terrain and stand features. Minimize fragmentation and maintain the highest level of interior habitat consistent with meeting overall resource objects, except for Pine series forest types where a mix of various sized seral patches may be desired.

## **C. Management Direction for Program Implementation**

1. **Variation by Ecological Type:** Planning and implementation of specific projects will be strongly based on an understanding of the ecological relationships and limitations of the communities proposed for management.

**Pine Series:** Prescriptions would discriminate in favor of a higher proportion of ponderosa pine in the stand than current and would target reduction in understory densities. Stand densities would normally be reduced to less than 100 square feet of basal area.

**Douglas-fir Series:** Regeneration patch sizes would vary to maintain pine and other species in the stand. Mistletoe and excessive madrone regeneration will require variation in prescriptions. Retention of canopy cover and careful choice of site preparation technique should be used to maintain deerbrush and grass at levels that prevent target stand conditions to be reached. Deerbrush and legumes should be retained in the system.

**Shasta red fir Series:** Management actions would consider limitations imposed by growing season frosts and would be designed to restore a higher proportion of white pine and Douglas-fir on sites where those components have been lost.

**White fir Series:** Management actions would consider limitations imposed by growing season frosts and will be designed to restore a higher proportion of pine and Douglas-fir in stands from which those components had been lost.

2. **Qualification of Stands for Management Deferral:** Harvest entries would usually not be planned for the next decade for stands with less than 40 percent live canopy cover, except for stands of the Pine Series. Salvage of volume from these stands following partial or complete stand mortality would be permitted provided structural objectives were met.

### 3. Stand Structural and Species Composition:

**Structural Composition:** Maintain site productivity and wildlife habitat values through the retention of structure and the design of practices required to maintain ecosystem processes throughout the management cycle. Retain on the average 16-25 larger green trees per acre in harvest units. For specific Standards and Guidelines on coarse woody debris, green tree, and snag retention refer to pages C-40 through C-44 of the Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl, sections "Provide specified amounts of coarse woody debris in matrix management," "Emphasize green-tree and snag retention in matrix management," "Standards and Guideline Specific to Northern Spotted Owl Habitat for Lands Administered by the Bureau of Land Management in Oregon," and "Provide additional protection for caves, mines, and abandoned wooden bridges and buildings that are used as roost sites for bats." In addition, a minimum of two large hardwoods, if present would be left per acre. Logging safety and potential tree mortality would be considered when determining the distribution of retain trees and snags.

**Species Composition:** Manage so that tree species trend over time toward Target Species Composition Objectives, see Table G-1. Manage shrubs, forbs, and other vegetation consistent with land use allocation objectives.

**Table G-1. SGFMA Target Stand Species Composition Objectives.**

**Desired Species Composition (by percent conifer basal area)**

Plant Series	Ponderosa pine	Douglas fir	White fir	Shasta Red-fir	Incense Cedar	Sugar Pine	Western White Pine	Lodge-pole Pine	Western Juniper
Ponderosa Pine	50-95	0-35	0-20	--	0-5	0-2	--	0-5	1-20
White fir	5-40	10-50	40-60	5-20	5-20	1-5	0-10	1-10	--
Douglas-fir	5-30	60-85	2-10	0-5	0-5	1-5	0-10	0-5	--
Shasta Red Fir	--	5-20	5-20	40-80	--	--	2-5	0-30	--

4. **Landscape Design Elements:** Manage so that continuous forest areas harvested through one or more treatments (for example, group selections and dense-reserve patches interspersed within a thinning unit) will generally be between 20 and 120 acres in size. Harvest unit shapes would be constrained by economic practicality and logging system capabilities. Retain dead and green structure within group selections consistent with meeting long term stand composition goals. Situate harvest units to meet general landscape objectives, including minimizing fragmentation and providing general landscape connectivity. Harvest methods could vary within stand to: a) reflect current within-stand spatial patterns, b) as required to meet stand objectives, and c) to retain or create patches of reproductive or other habitat for key wildlife species.
5. **Regeneration Harvests:** Regeneration harvests would not be programmed for stands under 120 years of age and generally would not be programmed for stands under 150 years of age within the next decade unless required by deteriorating stand condition, disease, or other factors that threaten the integrity of the stand. Priority for harvest in stands under 150 years of age would be commercial thinning.

Regeneration strategies would be planned to produce the highest probability of success at the lowest practical cost and will include provisions for species diversity and long-term site productivity within the design. Practices will be strongly influenced by consideration of ecological site potential, for retention of sufficient canopy to assure control of competing vegetation, by the requirements of owl habitat connectivity at the stand level, and by factors including growing season frost potential.

6. **Commercial Thinning:** Stand densities would be maintained within desired ranges through a combination of planting density, precommercial thinning, commercial thinning, and management of fine-grained

stand detail. Commercial thinning entries would be programmed for stands under 150 years of age, often in conjunction with limited selection harvest in stands over 80 years. Thinning in older stands will often result in understory regeneration and the development of multiple-canopied stands. Units will retain patches of denser habitat where desired to meet wildlife habitat criteria.

7. **Activity Scheduling:** Stand treatment priority would result from the watershed analysis process. General priorities for stand treatments are shown in Table G-2.

**Table G-2. Treatment Priority by Ecological Type**

Treatment Type	Pine	White fir	Douglas fir	Shasta Red Fir
Understory Density Control	High	Medium	High	Medium
Stand Density Management	High	Medium	High	Medium
Density Management and Group Selection	Medium	Medium	Medium	Medium
Regeneration Harvest or Overstory Removal	Low	Low	Low	Low
Underburning	High	Medium	Medium	Medium

8. **Disease Management:** Design silvicultural treatments so that within-stand endemic levels of tree disease do not increase and so that, where possible, infected trees contribute to the achievement of land use allocation objectives. Creation of snags over time as a root rot center expanded would be an example of using tree disease to meet a structural objective. Mistletoe infected trees should be located in topographic positions that are not conducive to the spread of the disease and which are favorable for the production of nest groves. Treatment of stumps with borax would be done as needed to prevent air-borne infection of the stumps with root rot fungi, and prevent its spread to adjacent trees via root grafts.
9. **Forest Condition (Forest Health) Restoration:** Priority for restoration treatments will be determined at the stand level and will be based on the stand's ability to meet management objectives in the long-term.

## Late-Successional/District Designated Reserves

Late-Successional/District Designated Reserves would be managed to protect and enhance conditions of late-successional and old-growth forest ecosystems, which serve as habitat for the northern spotted owl and other late-successional and old-growth related species. Silvicultural practices and salvage should therefore be guided by the objective of maintaining adequate amounts of suitable habitat.

Silvicultural practices within reserves would be limited to those practices beneficial to the creation of late-successional forest conditions and would include reforestation, maintenance and protection of existing young stands, density management, and fertilization. In addition to practices that put or maintained stands on desired developmental pathways, practices designed to restore forest condition (forest health) and other practices designed to reduce the risks of stand loss would be done to maintain long-term habitat viability.

"While risk-reduction efforts should generally be focused on young stands, activities in older stands may be appropriate if: (1) the proposed management activities will clearly result in greater assurance of long-term maintenance of habitat, (2) the activities are clearly needed to reduce risks, and (3) the activities will not prevent the Late-Successional Reserves from playing an effective role in the objectives for which they were established." ("Guidelines to Reduce Risks of Large-Scale Disturbance," page C-13, Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl).

Salvage of mortality volume is limited to stand-replacing disturbance events exceeding 10 acres under standards outlined under "Guidelines for Salvage," page C-13, Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl.

## **Riparian Reserves**

Silvicultural activities within Riparian Reserves will be designed to meet the objectives of the Aquatic Conservation Strategy. Generally, standards and guidelines prohibit or regulate activities in the reserves that retard or prevent attainment of Strategy objectives. Silvicultural practices would be applied within the reserves to control stocking, to reestablish and manage stands, to establish and manage desired non-conifer vegetation, and to acquire desired vegetation characteristics needed to attain objectives of the Aquatic Conservation Strategy. Forest condition (forest health) restoration would be done where required to attain objectives of the Aquatic Conservation Strategy.

Salvage operations would be done only when watershed analysis determines that present and future coarse woody debris needs are met and other Aquatic Conservation Strategy objectives are not adverse

## **Other Allocations**

Silvicultural practices where appropriate would be designed to be consistent with the objectives of the allocation.

## **Hardwoods**

Manage hardwood stands for production of commodities as markets develop. Regenerate harvested stands with the same hardwood species mix. Harvest up to 1/200 of the hardwood allocation per year.

Suitable commercial forest land allocated to timber production, but dominated by grass, shrubs, and hardwood that resulted from human activity would be restored to conifer production. Hardwood species would be retained to maintain species richness. Natural hardwood and shrub communities on suitable commercial forest land would not be converted to conifer production.

Stands on commercial forest land that are dominated by commercial conifers, which also contain a high percentage of hardwoods as a successional stage, would be managed for timber production.

Manage white oak woodlands to meet wildlife, range, and biological diversity objectives.

## **Research**

A variety of wildlife and other research activities may be ongoing, currently proposed, or proposed in the future in all land allocations. Provided certain requirements are satisfied, ongoing research may continue and new research may begin. For a discussion of research requirements see, "Research" page C-4, under "Standards and Guidelines Common to all Land Allocations" in Standards and Guidelines for Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl. Research discussions can also be found under some of the individual allocations.



# Forest Genetics Program

For thousands of years humans have selected and used the genetic variation which is naturally present in plants and animals. Genetic diversity is the foundation for plant and animal improvement programs. Modern crop and livestock improvement programs have substantially increased yields and productivity with selection and breeding. The need for food production and natural resources is increasing as the human population increases. Genetic improvement programs have and will continue to help meet these demands.

The genes in all organisms are the basis of their diversity. Genetic diversity is a key component of an ecosystem. Broad genetic diversity is considered to be an asset because variability is a buffer against change. Problems can occur when genetic diversity is too narrow. Genetic uniformity decreases resilience to change and increases the potential for problems due to pests and diseases. Environmental conditions influence the expression of the genetic code. The physical characteristics of an organism are dependent on the interaction of its genes with the environment. Ecosystems are dynamic communities which change over time and plants and animals are impacted by the changes. Species with wide tolerances can adapt to changes, while those with narrow tolerances can be heavily impacted.

The amount and pattern of genetic diversity in a species develops in part as an organism responds to the environment. This adaptation occurs over a long period of time as the environmental conditions select for or against specific genetic traits. Each species has a unique genetic structure. Genetic studies are conducted to describe and quantify the amount of genetic variation within a species. This information is necessary to direct management and to help guide operational projects.

Genetic diversity can be described as a natural resource. Management and conservation of genetic resources is vital for many reasons. Genetic improvement programs are a great benefit to society and genetic materials have a large economic value. Genetic material from wild stock is an important source of variability which can be infused into existing improved varieties. Many medicinal compounds are derived from plants and there is the potential for more undiscovered uses. Conserving genetic diversity for all species allows evolutionary processes to continue within the conditions of the natural environment.

Tree improvement is the application of genetic principles and methods to forest trees. Many of the desirable traits in trees can be enhanced with tree improvement. The Bureau of Land Management has participated in cooperative tree improvement programs for forest trees in the Pacific Northwest since the late 1950's. The emphasis to date has been in improvement of growth and disease resistance. Ecosystem management principles are changing the focus of the tree improvement program. The existing tree improvement and seed orchard programs will be integrated into a broader based forest genetics program. Genetic diversity issues for many organisms will likely become more important in the future. A forest genetics program is consistent with ecosystem management principles and can be expanded to cover the genetics of other plants and animals.

This appendix describes the objectives of the forest genetics program, the present status, and proposed direction. The BLM Western Oregon Tree Improvement Plan (1987) describes the technical details of the program. Additional general information on genetic resource issues can be found in *The Value Of Genetic Resources* (Oldfield 1984) and *Genetics and Conservation Of Rare Plants* (Falk and Holsinger 1991).

## Program Objectives

The objectives of the forest genetics program underlay a broad spectrum of land management activities. The biological foundation of ecosystem management rests upon a clear understanding of the genetic diversity present within the system. The following objectives are broadly defined and include tree improvement, gene management, and gene conservation activities.

- ◆ Provide for seed production as needed for planting species on BLM lands. Develop seed collection and seed deployment guidelines as needed.

## *Appendix G - Silvicultural Systems Utilized in the Design of the Proposed Action*

- ◆ Develop genetically improved materials as needed to meet BLM's resource management objectives.
- ◆ Maintain and restore the genetic diversity within managed forest stands.
- ◆ Analyze needs and implement gene conservation strategies as appropriate.
- ◆ Collect information on genetic variation from important species.
- ◆ Contribute to the development of genetic information needed for landscape analysis, ecological assessments, research studies and ecosystem management projects.
- ◆ Maintain flexibility within the program so that information fulfills the current needs and anticipates future needs.

## **Status of the Existing Program**

The BLM tree improvement program has generated a substantial and important genetic information base for several conifer species. The data is significant to ecosystem management because it describes the nature and extent of genetic variation present for traits of the species.

Tree improvement programs function at a landscape level. Genetic diversity is continuous across the landscape and tree improvement programs are implemented at this level. Each program is a small ecologically similar area called a breeding unit. Most tree improvement programs are cooperatives with BLM and adjacent land owners. A cooperative structure is beneficial because it greatly increases the number of trees in the genetic base and the trees are located across a broader geographic area. Program costs are shared among cooperators which is more efficient. BLM is cooperating in more than fifty breeding units which include several million acres of forest land in Western Oregon.

The following accomplishments summarize the status of the program.

- ◆ Several conifer species (Douglas-fir, western white pine, sugar pine) have been selected for genetically controlled characteristics such as growth rate, form and resistance to disease.
- ◆ Field tests have been established using progeny of the selected trees. These progeny test sites have been measured at regular intervals.
- ◆ Seed orchards have been established using parent trees. The orchards are producing locally adapted seed for several major species (Douglas-fir, western hemlock, western red cedar, ponderosa pine, grand fir, noble fir, incense cedar).
- ◆ Each year improved seed is sown for replanting a portion of the harvested forest acres.
- ◆ The seed orchards are managed for seed production. Stimulation techniques are part of the management to encourage cone production. Trees which have slow growth in field tests or show undesirable characteristics are removed from the orchard. This practice is known as "roguing".
- ◆ Second generation programs have been initiated in some breeding units. Selection and breeding work is underway.
- ◆ Facilities for cone and seed processing and greenhouses for growing custom tailored lots of many species are located at the seed orchards.

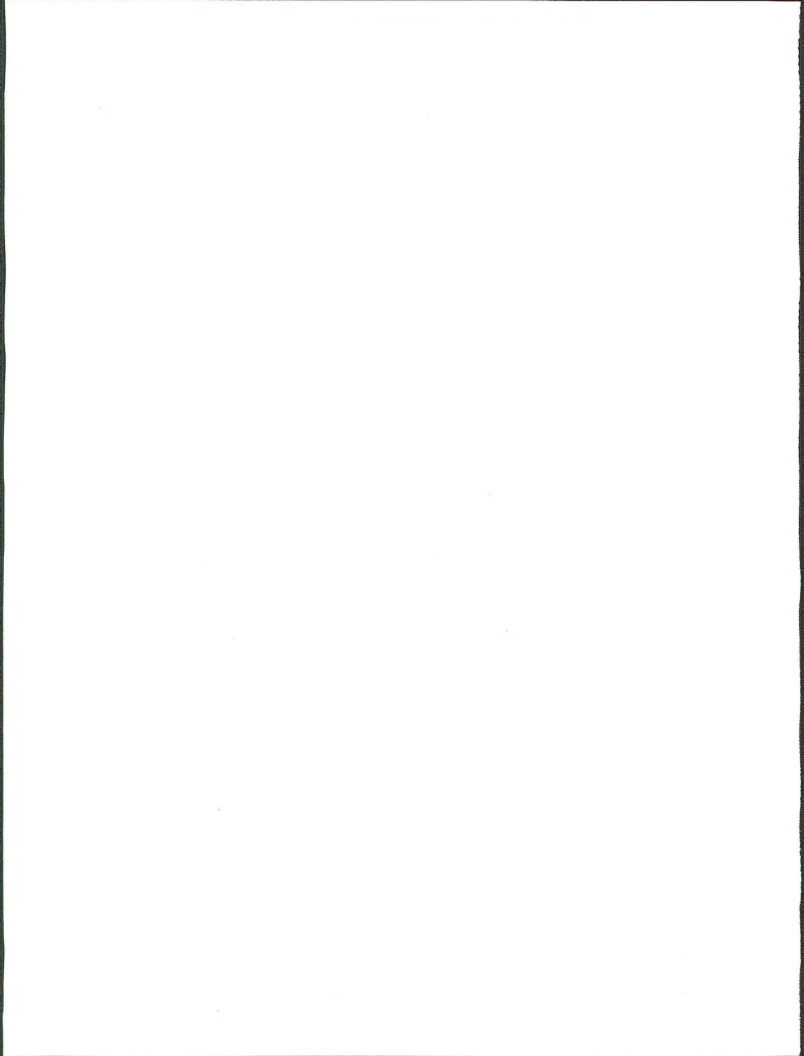
## Proposed Program Direction

The future forest genetics program will be more complex under ecosystem management than under the previous management plans. Improvement of growth and disease resistance will continue as an important component of the forest genetics program. Gene conservation and gene resources management issues will be emphasized to a greater degree. Gene conservation is specific actions taken to conserve the genetic variation of a species. The purpose is to maintain the range of natural diversity within the species. Gene management is the integration of genetic principals into resource management actions. Ecosystems are complex and genetic diversity is important for all organism. Genetic principals must be considered when planning and implementing resource management projects so that genetic diversity is maintained.

The following is a summary of the direction for the forest genetics program.

- ◆ Progeny test sites will be maintained and measurements of growth and other characteristics will continue. Long term management plans for the sites will be developed.
- ◆ Seed orchards will be maintained and managed to produce seed as needed for ecosystem management projects.
- ◆ Improved stock will be planted on a portion of the harvested acres.
- ◆ Tree improvement programs have emphasized cooperative efforts for operational programs and research studies with state, private, and other government agencies. These partnerships will continue.
- ◆ Genetic expertise and genetically appropriate guidelines will be provided for ecosystem management implementation.
- ◆ A forest genetic plan will be prepared. It will include a strategy for gene conservation, maintenance of genetic diversity and definition of a monitoring baseline to quantify genetic variation.





# Appendix H

## Special Areas

### Introduction

This appendix contains three parts: Identification and Screening of Candidate Areas of Critical Environmental Concerns, Present Condition of Potential Special Areas, and potential management of Candidate Areas of Critical Environmental Concerns dropped from the area of critical environmental concern consideration. The first section describes the results of the screening process for areas of critical environmental concerns. The second section describes the current condition of various potential special areas. The third section is a table that shows proposed management of areas that were dropped from consideration as areas of critical environmental concern.

### Identification and Screening of Candidate Areas of Critical Environmental Concerns

During the initial stages of the planning process, the public, BLM employees, and other government agencies identified 12 sites within the planning area with resource values that could meet criteria for areas of critical environmental concern. These identified areas became candidate areas. To be a potential area of critical environmental concern, a candidate area must meet both "importance" and "relevance" criteria. Each candidate area was screened by an interdisciplinary team to determine whether these criteria were met, and if met, the interdisciplinary team proposed boundaries and management objectives for the potential area of critical environmental concern. The interdisciplinary team recommendations were then submitted to the Area Manager for a decision and then to the District Manager for concurrence. The results of this process are summarized in the table below.

# Candidate Area of Critical Environmental Concern Screening Results

Candidate ACEC	Nomination Source	Nomination Acres	Relevance	Importance	ACEC Acres	Comments
Miller Creek	Audubon Society	0 <sup>1</sup>	Y-W,N,S	Y-L,F	2,000	Miller Creek Canyon from Gerber Dam to the Goodlow Rim, 200 feet either side of rim. Area will be further evaluated as a potential area of critical environmental concern.
Pacific Crest Trail/Old Baldy	Sierra Club	0 <sup>1</sup>	Y-N,S	Y-L,F	620	Only those BLM-administered lands located in Klamath County, including area immediately surrounding Old Baldy Area. The Klamath Falls Resource Area will follow Medford District's previous decision to further evaluate the area as a potential area of critical environmental concern. Old Baldy potential resource natural area included in the original screening process.
Upper Klamath River	Sierra Club	5,700	Y-H,C,S, F,W,N,Z	Y-L,F,P	4,960	Klamath River from rim to rim extending from John C. Boyle Powerhouse to the Oregon/California state line. Area will be further evaluated as a potential area of critical environmental concern.
Yainax Butte	BLM	480	Y-N	Y-L,F,P	720	BLM-administered lands on top of Yainax Butte. Area will be further evaluated as a potential area of critical environmental concern.
Alkali Lake	BLM	240	No	No	240	Wetland area located in Yonna Valley. Area will not further be evaluated as an area of critical environmental concern. Area will be further evaluated for special management.
Spencer Creek	BLM	320	Y-F,S	Y-F	320	Area will be further evaluated as a potential area of critical environmental concern.
Tunnel Creek	Nature Conservancy	280	Y-N	Y-F,P	280	Natural wetland communities present are threatened statewide. Area will be further evaluated as a potential area of critical environmental concern.

The Bumpheads	BLM	50	Y-S,N	Y-F,P	50	Several rim-rock-bordered tabletops in Gerber Block. Area will be further evaluated as a potential area of critical environmental concern.
Clover Creek	BLM	30	No	No	30	Area will not be further evaluated as an area of critical environmental concern. Area will be further evaluated for special management.
Surveyor Forest Area	BLM	150	Y-N,S,W	Y-F,P	150	Unlogged, old growth area adjacent to Surveyor Recreation Site. Area will be further evaluated as a potential area of critical environmental concern.
Barnes Valley Creek	BLM	480	Y-S	No	480	From Gerber Reservoir east to Moonshine Spring. Area will not be further evaluated as an area of critical environmental concern <sup>2</sup> .
Lower Goodlow Mountain	BLM	1,760	No	No	1,760	Area adjacent to Goodlow Mountain resource natural area on the Freemont National Forest. Area will not be further evaluated as an area of critical environmental concern.

<sup>1</sup> Physical description given in nomination, acreage figures not included.

<sup>2</sup> Shortnose suckers were identified in Barnes Valley Creek after the Area of Critical Environmental Concern screening process. An Area of Critical Environmental Concern designation would not provide anymore protection to these endangered fish species that what is already provided under the Endangered Species Act. The Aquatic Conservation Strategy and Sucker Recovery Plan will be followed.

#### Abbreviations used in this table:

Relevance	Importance	
C - Cultural Value	S - Scenic Value	F - Fragile, Sensitive, Unique, Threatened, etc.
F - Fish Value	W - Wildlife Value	T - Poses a Threat
H - Historic Value	Z - Natural Hazard	Y - Yes, meets the criteria for the listed
N - Natural Process or System		No - Does not meet any of criteria
		L - More than Locally Significant
		P - Warrants Protection

## Present Condition of Potential Special Areas

Special Area	Present Condition
Miller Creek Potential Area of Critical Environmental Concern	Very scenic, natural ecosystem that is a unique feature of Gerber Plateau. Vegetative communities differ from those that dominate the surrounding plateau due to increased soil moisture and decreased air temperature. Some localized timber harvesting near stream crossing in section 13. Riparian zone in relatively good condition, steep canyon walls have naturally restricted livestock grazing and timber harvesting.
Pacific Crest Trail Potential Area of Critical Environmental Concern	Limited timber harvest (thinnings) along this section of Pacific Crest Trail. Predominately young Shasta red fir with very little understorey vegetation, and associated high elevation brushfields. Good scenic viewing opportunities along this section of the trail. Area closed to off-highway vehicle use.
Upper Klamath River Potential Area of Critical Environmental Concern	Designated state scenic waterway by Oregon voters. Wide diversity of plant communities and wildlife. Evidence of intense livestock grazing. No timber sale activity during the last decade. Few significant scenic quality detractors to casual observer. Great variety of cultural resources needing interpretation and protection. City of Klamath Falls has an application pending for proposed Salt Caves Hydroelectric Project.
Yainax Butte Potential Area of Critical Environmental Concern	Area receives limited use by recreationists, mostly hunters in fall. Site is relatively isolated and steep which naturally protects it from surrounding land uses such as livestock grazing and timber harvesting. It contains natural diversity due to elevational differences. Significant populations of threatened and endangered plant species.
Alkali Lake	Wetlands characterized by shallow lake and associated vegetation. Area surrounding lake grazed. Migratory waterfowl present. No public access
Spencer Creek Potential Area of Critical Environmental Concern	The riparian zone is characteristic of high gradient stream reaches with little depositional material, and consequently no wet meadow development. The creek flows through mixed conifer forest that has had several timber harvests, with riparian buffers kept intact. The area has high scenic quality, clear, cascading waterfalls, significant trout fisheries, and spawning habitat.

Tunnel Creek Wetlands  
Potential Area of Critical  
Environmental Concern

Wetlands characterized as a lodgepole pine/western bog huckleberry swamp. Part of site, owned by Weyerhaeuser Company, has been clearcut. The site still offers considerable benefits for a diversity of wildlife species as well as the natural wetland communities present.

The Bumpheads Potential  
Area of Critical Environmental  
Concern

The Bumpheads are rim-rocked volcanic tabletops located in the Gerber Block. They are in good condition with healthy bunchgrasses and western juniper prominent in the natural plant community, and have been naturally isolated from grazing. Good scenic viewpoint of surrounding terrain.

Clover Creek Forest  
Education Area

The site is near Clover Creek, which often is dry or at least goes underground on a variable basis. The riparian zone is dominated by aspens and willows with a sedge understory. The forest education site has received limited grazing and selective timber harvesting. Area presently used by local elementary schools for annual forestry tour. Potential for developing nearby area for day use parking and winter snow park.

Surveyor Forest Potential  
Area of Critical Environmental  
Concern

This area, adjacent to Surveyor recreation site, is characterized by an unlogged, old growth forest community. Species mix includes white fir and other mixed conifers with dominant, large Douglas fir. The area is grazed. The boundaries of the area include those stands that have not been timber harvested. Opportunities for interpretation and forest education.

Old Baldy Proposed  
Research Natural Area

High elevation brushfield with associated young Shasta red fir/white fir. A revised boundary survey has been made to exclude previous timber sale harvest areas. Core areas of proposed research natural area are generally protected from previous timber thinning areas.

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# Potential Management of Candidate Areas of Critical Environmental Concerns Dropped from Consideration

Area Name	Acres Dropped	(Primary Values)	Description Alternative	Managed For
Lower Goodlow Mountain	1,760	Plant communities related to Goodlow Mountain Research Natural Area.	No Action/A-E/ Proposed Resource Management Plan	No special management. Plant communities present on BLM lands do not differ appreciably from those already protected in the existing Research Natural Area.
Barnes Valley Creek	480	Scenic value, water quality concerns	No Action	100 foot no cut buffer, Visual Resource Management Class II management.
			A, B	Riparian management area, minimum 75 to 100 foot buffer either side of high water mark.
			C through E	Riparian management area, minimum 150 to 200 foot buffer either side of high water mark. Visual Resource Management Class II management.
			Proposed Resource Management Plan	Riparian reserve, 300 foot buffer either side of stream channel, Visual Resource Management Class II management, livestock controlled by fencing. Endangered Species Act protection for endangered sucker fish.
Alkali Lake	240	Riparian/Wetland	No Action/A/B	No special management other than to consider/pursue land exchange opportunities.
			C through E	Actively pursue land exchange opportunities, control grazing by fencing, off-highway use limited.
			Proposed Resource Management Plan	Special Botanical/Habitat area, open to off-highway vehicle use (no public access, actively pursue land exchange and legal access opportunities, mineral leasing subject to no surface occupancy, control grazing by fencing.



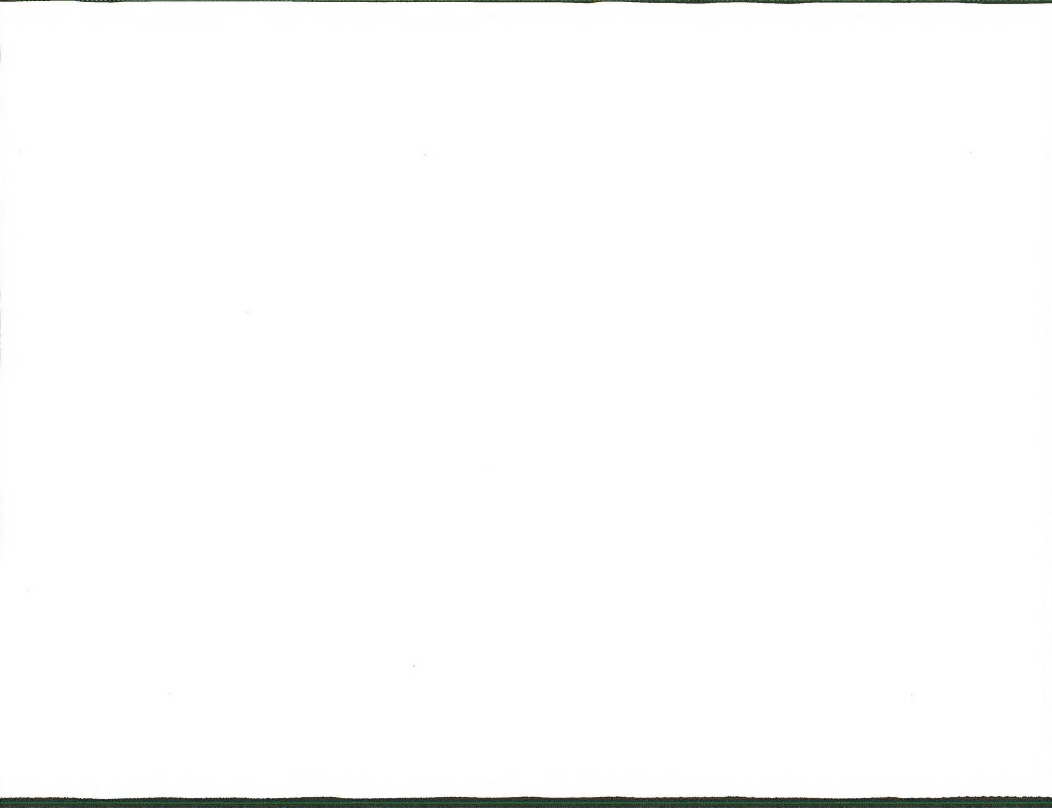
Clover Creek Forest Education	30	Forest Education	No Action/A/B	No special management.
			C through E	Restricted timber harvest to meet objectives of forestry tour site.
			Proposed Resource Management Plan	Environmental Education Area, restricted timber harvest (Matrix) to manage and maintain for forest education values and forest health, open to off-highway vehicle use, open to grazing use, mineral leasing subject to no surface occupancy.
Surveyor Forest Area	150	Education, Natural Processes	No Action/A/B	Not designated as an area of critical environmental concern. available for timber harvest, open to off-highway vehicle use and grazing use.
			C	Area to receive special management attention. Not available for planned timber harvest, off-highway vehicle use limited, control grazing by fencing, mineral leasing subject to no surface occupancy.
			D/E	Same as C except area designated area of critical environmental concern and area not available for timber harvest.
			Proposed Resource Management Plan	Same as C, except designated Environmental Education Area (administratively withdrawn).
Tunnel Creek Wetlands	280	Natural System	No Action/A/B	Not designated as an area of critical environmental concern. Available for timber harvest. Open to off-highway vehicle use and grazing use.
			C	Area to receive special management attention. Available for restricted timber harvest; off-highway vehicle use limited; control grazing by fencing; mineral leasing subject to no surface occupancy. Actively pursue cooperative land management or land exchange opportunities with private land.
			D/E	Same as C except area designated area of critical environmental concern. Not available for planned timber harvest; closed to off-highway vehicles.

# Potential Management of Candidate Areas of Critical Environmental Concerns Dropped from Consideration (continued)

Area Name	Acres Dropped	(Primary Values)	Description Alternative	Managed For
Tunnel Creek Wetlands (Continued)			Proposed Resource Management Plan	Same as C except area designated special Botanical/Habitat Area (Riparian Reserve and Late-Successional/District Designated Reserve)
The Bumpheads	50	Natural Systems, Scenic	No Action/A/B	Area not designated as an areas of critical environmental concern. Open to off-highway vehicle use, and grazing use.
			C	Area to receive special management attention. Off-highway vehicle use limited; control grazing by fencing; mineral leasing subject to no surface occupancy.
			D/E	Same as C, except area designated as an area of critical environmental concern and area closed to off-highway vehicle use.
			Proposed Resource Management Plan	Same as C, except area designated as an Special Botanical/Habitat Area.
Pacific Crest National Scenic Trail	620	Natural Process Scenic	No Action/A/B	Area not designated as an area of critical environmental concern. available for timber harvest; closed to off-highway vehicle use; open to grazing use.
			C through E	Designated as an area of critical environmental concern. Not available for planned timber harvest; closed to off-highway vehicle use; open to grazing use; mineral leasing subject to no surface occupancy.
			Proposed Resource Management Plan	Not designated as an area of critical environmental concern. Area to receive 50 foot no harvest buffer either side of trail plus 1/4 mile visual Resource Management Class II either side of trail. Closed to off-highway vehicle use; open to grazing use; mineral leasing subject to no surface occupancy.

Spencer Creek	320	Fisheries	No Action/A/B	Not designated as an area of critical environmental concern. Available for timber harvest; open to off-highway vehicle use and grazing use. Coordinated Resource Management Plan
			C	Area to receive special management attention. Restricted timber harvest and grazing; closed to off-highway vehicles. Coordinated Resource Management Plan.
			D	Area designated as an area of critical environmental concern. Not available for planned timber harvest; closed to off-highway vehicle use. Coordinated Resource Management Plan. Mineral leasing subject to no surface occupancy; restricted grazing.
			Proposed Resource Management Plan	Same as C except area within 300 foot either side of creek a Riparian Reserve. Visual Resource Management Class II 1/4 mile either side of creek. Watershed analysis to be completed. Mineral leasing subject to no surface occupancy.

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# Appendix I

## Wild and Scenic Rivers

### Introduction

This appendix is comprised of four major sections. The first section, Management Guidelines and Standards for National Wild and Scenic Rivers, applies to BLM-administered lands along both formally designated rivers and, on an interim basis, along eligible rivers. Also discussed in this section are the Oregon Scenic Waterways Act and management constraints on private lands. The second section, Wild and Scenic River Eligibility and Classification Determinations, describes the criteria used to determine the eligibility and highest potential classification of a study river. The third section, Wild and Scenic River Suitability Assessments, contains five assessments for the six river segments in the planning area that were found to be eligible. This section includes a summary of the eligibility and classification determinations for each of the rivers. The fourth and final section, Management Direction for the Upper Klamath River in California, is excerpted from the Redding (California) Resource Area BLM Resource Management Plan/Environmental Impact Statement Record of Decision (June 1993). It was included to give the reader a more complete picture of how the entire eligible stretch of the river (segment 2 in Oregon and segment 3 in California) is proposed to be managed, since management of adjoining sections is more reasonable.

### Management Guidelines and Standards for National Wild and Scenic Rivers

The Wild and Scenic Rivers Act (Public Law 90-542 as amended) established a method for providing federal protection for certain of our remaining free-flowing rivers, and preserving them and their immediate environments for the use and enjoyment of present and future generations. Rivers are included in the system so that they may benefit from the protective management and control of development for which the Act provides. The following guidelines and standards are extracted in part from the February 3, 1970 and August 26, 1982 Joint Department of the Interior and Department of Agriculture guidelines. They would apply to BLM-administered lands along formally designated rivers through incorporation in formal management plans, which are normally developed within three years of designation. The guidelines also apply, on an interim basis, to BLM-administered lands along BLM study rivers, as well as other rivers or river segments that have been found by the Bureau to be eligible for consideration as components of the National Wild and Scenic River System. In the latter instance, interim application of the guidelines would continue until lifted by a determination of nonsuitability through BLM's planning (Resource Management Plan) process or by Congressional action.

Section 10(a) of the Act states that:

"Each component of the National Wild and Scenic Rivers System shall be administered in such a manner as to protect and enhance the values which caused it to be included in said system without, insofar as is consistent therewith, limiting other uses that do not substantially interfere with public use and enjoyment of these values. In such administration, primary emphasis shall be given to protecting its esthetic, scenic, historic, archaeological, and scientific features. Management plans for any such component may establish varying degrees of intensity for its protection and development, based on the special attributes of the area."

This section is interpreted by the Secretaries of the Interior and Agriculture as stating that all designated river areas, regardless of classification, will be enhanced and not degraded.

## **Appendix I - Wild and Scenic Rivers**

The Congress with Presidential approval may determine which river segments will be added to the National Wild and Scenic River System. When a river is designated, and the BLM is identified as the administering federal agency, the BLM will establish administrative boundaries to protect the identified outstandingly remarkable values. By law, the land inside the boundaries normally may not exceed an average of 320 acres per river mile over the designated portion of the river. The BLM would delineate boundaries based on natural or developed features (canyon rims, roads, ridge tops, etc.) and with consideration of legally identifiable property lines.

A river management plan must be also completed by the administering federal agency within three full fiscal years after the river has been designated. Existing state, local, and federal laws continue in effect during the interim along with general Department of Interior guidelines. If federal designation overlaps state scenic waterway designation, a joint federal/state management plan would be developed. All management plans will address the roles of federal, state, county, and relevant Indian tribal governments in management of the river.

For the sake of clarity, the guidelines that follow are presented for each separate river classification (recreational, scenic, and wild river areas). River classifications are further described in the Wild and Scenic Eligibility and Classification Determinations section of this appendix.

## **Recreational River Areas**

Recreational rivers are defined by the Act to be "Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past."

### **Management Objective for Recreational River Areas**

Management of recreational river areas should be designed to protect the existing outstandingly remarkable values. The primary objective will be to provide opportunities for the public to participate in recreation activities dependent on or enhanced by the largely free-flowing nature of the river.

### **Management Standards for Recreational River Areas**

Recreation facilities may be established near the river, although recreational river classification does not require extensive recreational developments. Recreation facilities may still be kept to a minimum, with visitor services provided outside the river area. Future construction of impoundments, diversions, straightening, rip-rapping, and other modification of the waterway or adjacent lands would not be permitted except in instances where such developments would not have a direct and adverse effect on the river and its immediate environment. The following program management standards apply:

**Forestry Practices.** Forestry practices, including timber harvesting, would be allowed under standard restrictions to avoid adverse effects on the river environment and its associated values.

**Hydroelectric Power and Water Resource Development.** No development of hydroelectric power facilities would be permitted. Existing low dams, diversion works, rip rap and other minor structures may be maintained provided the waterway remains generally natural in appearance. New structures may be allowed provided that the area remains generally natural in appearance and the structures harmonize with the surrounding environment.

**Mining.** Subject to existing regulations, such as 43 CFR 3809, and any future regulations that the Secretary of the Interior may prescribe to protect values of rivers included in the National Wild and Scenic River System, new mining claims are allowed and existing operations are allowed to continue. All mineral activity on federally administered land must be conducted in a manner that minimizes surface disturbance, water sedimentation and pollution, and visual impairment. Reasonable mining claim and mineral lease access will be permitted. Mining claims within the designated area that are perfected after the effective date of river designation can be patented

only as to the mineral estate and not the surface estate. A mining claim is perfected when the claimant has satisfactorily met all the requirements for patenting.

**Road and Trail Construction.** Existing parallel roads can be maintained on one or both river banks. There can be several bridge crossings and numerous river access points. Roads, trails, and visitor areas must conform to construction and maintenance standards and be free of recognized hazards.

**Agricultural Practices and Livestock Grazing.** Lands may be managed for a full range of agriculture and livestock grazing uses, consistent with current practices.

**Recreation Facilities.** Interpretive centers, administrative headquarters, campgrounds, and picnic areas may be established near the river; however, a recreational classification does not require extensive recreation development. Any recreation facility development should result in no more than a moderate change in the characteristic landscape and should not dominate the view of the casual observer.

**Public Use and Access.** Recreation use including, but not limited to, hiking, fishing, hunting, and boating is encouraged in recreational river areas to the extent consistent with the protection of the river environment. Public use and access may be regulated and distributed where necessary to protect and enhance the outstandingly remarkable values.

**Rights-of-Way.** New transmission lines, natural gas lines, water lines, etc., are discouraged unless specifically prohibited outright by other plans, orders, or laws. Where no reasonable alternative location exists, additional or new facilities should be restricted to existing rights-of-way. Where new rights-of-way are unavoidable, locations and construction techniques will be selected to minimize adverse effects on outstandingly remarkable values and fully evaluated during the site selection process.

**Motorized Travel.** Motorized travel will generally be permitted on existed roads. Controls will usually be similar to that of surrounding lands. Motorized travel on water will be in accordance with existing regulations or restrictions.

## Scenic River Areas

Scenic rivers are defined by the Act to be "Those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads."

### Management Objective for Scenic River Areas

Management of scenic river areas should give emphasis to protecting the outstandingly remarkable values while providing river-related outdoor recreation opportunities in a semi-primitive or near-natural setting. The basic distinctions between a *recreational* and a *scenic* river area are the degree of development, types of land use, and road accessibility. In general, a wide range of agricultural, water management, silvicultural, and other practices or structures could be compatible with outstandingly remarkable values, providing such practices or structures are carried on in such a way that there is no substantial adverse effect on the river and its immediate environment.

### Management Standards for Scenic River Areas

Allowable management practices might include construction of minor structures for such purposes as improvement of fish and game habitat; grazing; protection from fire, insects, or disease; and rehabilitation or stabilization of damaged resources; provided the area will remain natural in appearance and the practices or structures are compatible and in harmony with the environment. Developments such as trail bridges, occasional fencing, natural-appearing water diversions, ditches, flow measurement or other water management devices, and similar



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facilities may be permitted if they are unobtrusive and do not have a significant direct and adverse effect on the natural character of the river area. Motorized vehicle use may, in some cases, be appropriate and development of larger scale public-use facilities within the river area, such as moderate-sized campgrounds, interpretive centers, or administrative headquarters would be compatible if such facilities were screened from the river. The following program management standards apply:

**Forestry Practices.** Silvicultural practices including timber harvesting could be allowed provided that such practices are carried on in such a way that there is no substantial adverse effect on the river and its immediate environment. The river area should be maintained in its near-natural condition. Timber outside the boundary, but within the visual seen area, should be managed and harvested in a manner that provides special emphasis on visual quality. Preferably, reestablishment of tree cover would be through natural revegetation. Cutting of dead or down materials for fuelwood will be limited. Where necessary, restrictions on use of wood for fuel could be prescribed.

**Hydroelectric Power and Water Resource Development.** No development of hydroelectric power facilities would be permitted. Flood control dams and levees would be prohibited. All water supply dams and major diversions are prohibited. Maintenance of existing facilities and construction of some new structures would be permitted provided that the area remains natural in appearance and the practices or structures harmonize with the surrounding environment.

**Mining.** Subject to existing regulations, such as 43 Code of Federal Regulations 3809, and any future regulations that the Secretary of the Interior may prescribe to protect the values of rivers included in the National Wild and Scenic River System, new mining claims are allowed and mineral leases can be allowed. All mineral activity on federally administered land must be conducted in a manner that minimizes surface disturbance, water sedimentation and pollution, and visual impairment. Reasonable mining claim and mineral lease access will be permitted. Mining claims within the designated area that are perfected after the effective date of scenic river designation can be patented only as to the mineral estate and not the surface estate. A mining claim is perfected when the claimant has satisfactorily met all the requirements for patenting.

**Road and Trail Construction.** Roads may occasionally bridge the river and short stretches of conspicuous roads or long stretches of inconspicuous and well-screened roads could be allowed. Maintenance of existing roads and any new roads or trails will be based on the type of use for which the roads are constructed and the type of use that will occur in the river area.

**Agricultural Practices and Livestock Grazing.** A wide range of agricultural and livestock grazing uses is permitted to the extent currently practiced. Row crops are not considered as an intrusion of the "largely primitive" nature of scenic corridors as long as there is not a substantial adverse effect on the natural-like appearance of the river area.

**Recreation Facilities.** Larger-scale public use facilities, such as moderate-sized campgrounds, interpretive centers, or administrative headquarters are allowed if such facilities are screened from the river. Any recreation facility development should result in no more than a minor change in the characteristic landscape and should not attract the attention of the casual observer.

**Public Use and Access.** Recreation use including, but not limited to, hiking, fishing, hunting, and boating is encouraged in scenic river areas to the extent consistent with the protection of the river environment. Public use and access may be regulated and distributed where necessary to protect and enhance outstandingly remarkable values.

**Rights-of-Way.** New transmission lines, natural gas lines, water lines, etc., are discouraged unless specifically prohibited outright by other plans, orders, or laws. Where no reasonable alternative exists, additional or new facilities should be restricted to existing rights-of-way. Where new rights-of-way are unavoidable, locations and construction techniques will be both selected to minimize adverse effects on outstandingly remarkable values and fully evaluated during the site selection process.

**Motorized Travel.** Motorized travel on land or water may be permitted, prohibited, or restricted to protect river values. Prescriptions for management of motorized use may allow for search and rescue and other emergency situations.

# Wild River Areas

Wild rivers are defined by the Act to include "Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America." The Klamath Falls Resource Area contains no river segments that meet this definition.

## Management Objective for Wild River Areas

Management of wild river areas should give primary emphasis to protecting the outstandingly remarkable values while providing river-related outdoor recreation opportunities in a primitive setting.

## Management Standards for Wild River Areas

The same considerations set forth for scenic river areas should be considered, except that the standards would probably be more strict. For example, motorized vehicle use may not be appropriate and construction of minor structures and facilities, if allowed, would be well screened from the river. The following program management standards apply:

**Forestry Practices.** Cutting of trees will not be permitted except when needed in association with a primitive recreation experience, such as clearing for trails and for visitor safety or to protect the environment, such as control of fire. Timber outside the boundary, but within the visual corridors should, where feasible, be managed and harvested in a manner to provide special emphasis to visual quality.

**Hydroelectric Power and Water Resource Development.** No development of hydroelectric power facilities would be permitted. No new flood control dams, levees, or other works are allowed in the channel or river corridor. All water supply dams and major diversions are prohibited. The natural appearance and essentially primitive character of the river area must be maintained. Federal agency groundwater development for range, wildlife, recreation, or administrative facilities may be permitted if there are no adverse effects on outstandingly remarkable values.

**Mining.** New mining claims and mineral leases are prohibited within 1/4 mile of the river. Valid existing claims would not be nullified and, subject to existing regulations, such as 43 Code of Federal Regulations 3809, and any future regulations that the Secretary of the Interior may prescribe to protect the rivers included in the National Wild and Scenic River System, existing mining activity on the existing claims would be allowed to continue. All mineral activity on federally administered land must be conducted in a manner that minimizes surface disturbance, water sedimentation, pollution, and visual impairment. Reasonable mining claim and mineral lease access will be permitted. Mining claims beyond 1/4 mile of the river, but within the wild river area boundary, that are perfected after the effective date of the wild river designation, can be patented only as to the mineral estate and not the surface estate. A mining claim is perfected when the claimant has satisfactorily met all the requirements for patenting.

**Road and Trail Construction.** No new roads or other provisions for overland motorized travel would be permitted within a narrow incised river valley or, if the river valley is broad, within 1/4 mile of the river bank. A few inconspicuous roads leading to the boundary of the river area and unobtrusive trail bridges may be permitted.

**Agricultural Practices and Livestock Grazing.** Agricultural use is restricted to a limited amount of domestic livestock grazing and hay production to the extent practiced prior to designation. Row crops are prohibited.

**Recreation Facilities.** Public-use facilities, such as campgrounds, interpretive centers, or administrative headquarters are located outside wild river areas. Simple comfort and convenience facilities, such as toilets, tables, fireplaces, shelters, and refuse containers may be provided as necessary within the river area. Any recreation facility development should harmonize with the surroundings. Unobtrusive hiking and horseback riding trail bridges could be allowed on tributaries, but would not normally cross the designated river.

**Public Use and Access.** Recreation use including, but not limited to, hiking, fishing, hunting, and boating is encouraged in wild river areas to the extent consistent with the protection of the river environment. Public use

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and access may be regulated and distributed where necessary to protect and enhance outstandingly remarkable values.

**Rights-of-Way.** New transmission lines, natural gas lines, water lines, etc., are discouraged unless specifically prohibited outright by other plans, orders, or laws. Where no reasonable alternative exists, additional or new facilities should be restricted to existing rights-of-way. Where new rights-of-way are unavoidable, locations and construction techniques will be selected to minimize adverse effects on outstandingly remarkable values and fully evaluated during the site-selection process.

**Motorized Travel.** Motorized travel on land or water could be permitted, but it is generally not compatible with this river classification. Normally, motorized use will be prohibited in a wild river area. Prescriptions for management of motorized use may allow for search and rescue and other emergency situations.

# **Management Objectives Common To Recreational, Scenic, and Wild River Areas**

## **Water Quality**

Water quality will be maintained or improved to meet federal criteria or federally-approved state standards. River management plans shall prescribe a process for monitoring water quality on a continuing basis.

## **Fire Protection and Suppression**

Management and suppression of fires within a designated river area will be carried out in a manner compatible with contiguous federal lands. On wildfires, suppression methods that minimize long-term impacts on the river and river area will be used. Presuppression and prevention activities will be conducted in a manner that reflects management objectives for the specific river segment. Prescribed fire may be used to maintain or restore ecological condition or meet objectives of the river plan.

## **Insects, Diseases, and Noxious Weeds**

The control of forest and range land pests, diseases, and noxious weed infestations will be carried out in a manner compatible with the intent of the Act and management objectives of contiguous federal lands.

## **Cultural Resources**

Historic and prehistoric resource sites will be identified, evaluated, and protected in a manner compatible with the management objectives of the river and in accordance with applicable regulations and policies. Where appropriate, historic or prehistoric sites will be stabilized, enhanced, and interpreted.

## **Fish and Wildlife Habitat Improvement**

The construction and maintenance of minor structures for the protection, conservation, rehabilitation, or enhancement of fish and wildlife habitat are acceptable provided they do not affect the free-flowing characteristics of the river, are compatible with the classification, the area remains natural in appearance, and the practices or structures harmonize with the surrounding environment.

## **Recreation**

The river management plan would evaluate current and potential recreational use and, if appropriate, identify a maximum carrying capacity for recreational boating use. The implementation of permit systems, other than

permits for commercial use (outfitters and guides) of federal lands and related waters, is typically undertaken only when public use approaches the identified maximum carrying capacity.

## Oregon Scenic Waterways Act

In 1969 the State of Oregon passed the Oregon Scenic Waterways Act. This legislation established a program to protect state designated rivers throughout Oregon and is administered by the Oregon Department of Parks and Recreation. Its goals are to protect the free-flowing character of designated rivers for fish, wildlife, and recreation. Dams, reservoirs, impoundments, and placer mining are prohibited on state scenic waterways. The Oregon Act requires review of new developments along designated rivers, but does not affect existing water rights, developments, or uses.

## Management Constraints On Private Lands

Designation of a river under the National Wild and Scenic Rivers Act gives the federal government no authority to regulate or zone private lands. Land use controls on private lands are solely a matter of state and local zoning regulations. Although the National Wild and Scenic Rivers Act includes provisions to encourage the protection of river values through state and governmental land use planning, these provisions are not binding on local governments. The federal government is responsible for assuring that designated rivers are managed in a manner which meets the intent of the Act.

River management plans may prescribe land use or development limitations to protect outstandingly remarkable river values. Many uses may be compatible with a wild, scenic, or recreational classification as long as the rivers are administered to protect and enhance the values that caused them to be included in the national system. Most existing uses and activities on adjoining private lands may continue. Timber harvest activities on private lands within a designated river boundary would continue to be regulated by the Oregon Forest Practices Act.

The primary consideration in any river or land use limitation would be the protection and enhancement of a designated river's outstandingly remarkable value(s). The BLM will work closely with landowners to assure that all uses will be consistent with the intent of the Act. Those uses that clearly threaten identified outstandingly remarkable values will be addressed on a case-by-case basis.

Specific management goals for construction of new buildings, other structures, or roads on private lands along designated rivers would be addressed through the individual river management plans. Federal guidelines allow different degrees of development along rivers, depending on their classification. In consultation with landowners involved, every effort would be made to reduce adverse impacts to an acceptable level on proposals for major up-grading, realignment, and/or new construction of roads. Maintenance of existing roads generally would not alter a river's condition and thus would not be restricted.

On designated rivers, the BLM could negotiate with a landowner to purchase specific development rights necessary to prevent any threat to the river's identified outstandingly remarkable values if all other efforts fail to reduce anticipated impacts to an acceptable level. Another option would be land exchange, where mutually agreeable, providing the private landowner with comparable lands outside the administrative boundary of a river.

The National Wild and Scenic Rivers Act specifically prohibits the use of condemnation in the fee title purchase of lands if 50 percent or more of the land within the boundary is already in public ownership. While the Act provides the federal government with authority to purchase scenic, conservation, or access easements through condemnation proceedings, this is considered to be a measure of last resort. In the event condemnation was considered necessary, the only landowner rights purchased would be those considered necessary to prevent the threat to the river or its outstandingly remarkable values.

If the BLM acquires an easement on private land, depending upon its terms and conditions, public access rights may or may not be involved. For example, a *scenic easement* could only involve the protection of narrowly defined visual qualities with no provisions for public use. A *trail or road easement* would involve public use provisions. Any provisions for public use of private lands must be specifically purchased from the landowner.



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The BLM would work closely with landowners to minimize public use of nonfederal lands, through brochures, maps, signs, and/or other appropriate means, except in locations where rights to such use are acquired.

River designation does not affect a private landowner's rights to control trespass. Landowners can charge a fee for crossing private lands to fish designated rivers except where a public access easement exists. The designation of a river into the National Wild and Scenic Rivers System does not change landowner rights unless all or a portion of these use rights are acquired from the landowner.

On navigable rivers, the river bed and banks to the mean high water mark are owned by the state and are available for public use under state laws. Private landowners control public access to their property along the banks of non-navigable rivers. The designation of a river into the National Wild and Scenic River System has no bearing upon its determination of navigability.

Ownership and use of valid water rights are not affected by a federal river designation.

# **Wild and Scenic River Eligibility and Classification Determinations**

## **Eligibility**

The first step in proposing additional rivers to the National Wild and Scenic Rivers System is to determine if the river is eligible. To qualify, a river must meet two criteria: (1) it must be free flowing and (2) with its immediate environment, it must have at least one outstanding remarkable value. Free-flowing, as defined in Section 16(b) of the Wild and Scenic Rivers Act, means "existing or flowing in natural condition without impoundment, diversion, straightening, rip-rapping, or other modification of the waterway." Free-flowing should not be confused with naturally flowing, which is flowing without any up-stream manipulation except by nature. The presence of impoundments above and below the segment (including those that regulate the flow regime through the segment) and existing minor dams and diversion structures within the study reach will not by themselves render a river ineligible. There are many river segments in the National Wild and Scenic River System that are downstream from major dams, such as the Rogue River in Oregon and the lower Klamath River in California, or are between dams, such as the Tuolumne River in California. Some components of the system, such as the Clackamas, Deschutes, and Snake rivers in Oregon and the Trinity River in California, even derive their recreational values, at least in part, from the operation of upstream dams. These values are stated in the National Wild and Scenic Rivers Act as "scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values". The Act did not specifically spell out the criteria to judge these values. The west side Oregon BLM districts developed criteria (written up in Instruction Memorandum OR-89-632) which, are described as follows:

A river's scenic, recreational, geologic, fish, wildlife, cultural, historic, or other similar value(s) are deemed "outstandingly remarkable" if one or more of the following guidelines apply to the value(s) under consideration.

**Scenic.** The landscape elements of landform, vegetation, water, color, and related factors must result in notable or exemplary visual features and/or attractions within the geographic region. The BLM Visual Resource Inventory Handbook, H-8410-1 may be used in assessing visual quality and in evaluating the extent of development upon scenic values. The rating area must be scenic quality "A" as defined in the BLM Visual Resource Inventory Handbook, H-8410-1. When analyzing scenic values, additional factors such as seasonal variations in vegetation, scale of cultural modifications, and length of time negative intrusions are viewed may be considered. Scenery and visual attractions may be highly diverse over the majority of the river segment length and not common to other rivers in the geographic region.

**Recreational.** Recreational opportunities are or have the potential to be unusual enough to attract visitors to the geographic region. Visitors are willing to travel long distances to use the river resources for recreational purposes. Recreation-related opportunities could include, but not be limited to, sightseeing, wildlife observation, camping, photography, hiking, fishing, hunting, and boating. Interpretive opportunities may be exceptional and

attract or have the potential to attract visitors from outside the geographic region. The river may provide or have the potential to provide settings for national or regional commercial usage or competitive events. In addition, the river may be eligible if it is determined to provide a critically important regional recreation opportunity, or be a significant component of a regional recreation opportunity spectrum setting.

**Geologic.** The river or the area within the river corridor contains example(s) of a geologic feature, process, or phenomenon that is rare, unusual, or unique to the geographic region. The feature(s) may be in an unusually active stage of development, represent a textbook example and/or represent a unique or rare combination of geologic features (erosional, volcanic, glacial, or other geologic structures).

**Fish.** Fish values may be judged on the relative merits of either fish populations or habitat, or a combination of these river-related conditions:

**Populations.** The river is nationally or regionally one of the top producers of resident, indigenous, and/or anadromous fish species. Of particular significance may be the presence of wild or unique stocks, or populations of State, federally listed, or candidate threatened and endangered species.

**Habitat.** The river provides exceptionally high quality habitat for fish species indigenous to the region. Of particular significance is habitat for State, federally listed, or candidate threatened and endangered species.

**Wildlife.** Wildlife values may be judged on the relative merits of either wildlife populations or habitat, or a combination of these conditions:

**Populations.** The river or area within the river corridor contains nationally or regionally important populations of resident or indigenous wildlife species dependent on the river environment. Of particular significance may be species considered to be unique or populations of State, federally listed, or candidate threatened and endangered species.

**Habitat.** The river or area within the river corridor provides exceptionally high quality habitat for wildlife of national or regional significance, or may provide unique habitat or a critical link in habitat conditions for State, federally listed, or candidate threatened and endangered species. Contiguous habitat conditions are such that the biological needs of the species are met.

**Cultural.** The river or area within the river corridor contains a site(s) where there is evidence of occupation or use by Native Americans. Sites must be rare, have unusual characteristics or exceptional human interest value(s). Sites may have national or regional importance for interpreting prehistory; may be rare; may represent an area where culture or cultural period was first identified and described; may have been used concurrently by two or more cultural groups; or may have been used by cultural groups for rare or sacred purposes.

**Historic.** The river or area within the river corridor contains a site(s) or feature(s) associated with a significant event, an important person, or a cultural activity of the past that was rare or unusual in the region. A historic site(s) and/or feature(s) in most cases is 50 years old or older. Sites or features listed in, or eligible for inclusion in, the National Register of Historic Places, may be of particular significance.

**Other Similar Values.** While no specific evaluation guidelines have been developed for the "other similar values" category, additional values deemed relevant to the eligibility of the river segment should be considered in a manner consistent with the foregoing guidance -- including, but not limited to, hydrologic, ecologic/biologic diversity, paleontologic, botanic, and scientific study opportunities.

## Classification

After determining a river's eligibility for inclusion in the National Wild and Scenic River System, it must be classified according to the category - wild, scenic, or recreational - that best fits each eligible segment. These



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terms can be misleading - a *scenic* river may have been designated for reasons other than scenery, and a *recreational* river doesn't necessarily have outstandingly remarkable recreational resources. Classification is based on the degree of naturalness and extent of development of the river and its adjacent lands as they exist at the time of the study.

Classifying a study river as wild, scenic, or recreational implies a level of interim protective management for federal lands in the study area until a decision on designations is made by the Congress. If the Congress designates a river or river segment, it will be managed according to how it is classified (a river segment can be classified at or below the highest level for which it qualifies). Specific management strategies may vary according to classification, but would be designed to protect and enhance the outstandingly remarkable values of the river area. These specific management strategies are formulated during development of the management plan, required within three full fiscal years of designation (section 3(d) (1) of the National Wild and Scenic Rivers Act).

The three classification categories for eligible rivers are defined in section 2(b) of the National Wild and Scenic Rivers Act as:

**Wild River Areas.** Those rivers or sections of rivers that are free of impoundments and generally inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. These represent vestiges of primitive America.

**Scenic River Areas.** Those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but accessible in places by roads.

**Recreational River Areas.** Those rivers or sections of rivers that are readily accessible by road or railroad, that may have some development along their shorelines, and that may have undergone some impoundment or diversion in the past.

A wild river would be a very undeveloped river with limited access. A scenic classification would be applied to a river or river segment that is more developed than a wild river and less developed than a recreational river. A recreational classification would be appropriate in developed areas, such as where a river runs parallel to roads or railroads with adjacent lands that have agricultural, forestry, commercial, or other developments, provided that the waterway remains generally natural and riverine in appearance.

The Federal Register, volume 47, number 174, September 7, 1982, gives guidance for classifying rivers. Water quality, water resources development, shoreline development, and accessibility are the criteria to be considered when determining classification. Each criterion is important, but their collective intent is more important. Although each classification permits existing development, the criteria do not imply that additional inconsistent development is permitted in the future. Developments that are compatible with designation would be allowed, provided they are carried out in an environmentally sound manner. Table I-1 further defines the four criteria.

**Table I-1. Classification Criteria for Wild, Scenic, and Recreational River Areas**

Attribute	Wild	Scenic	Recreational
Water Resources Development	Free of impoundment.	Free of impoundment.	Some existing impoundments or diversion. The existence of low diversions or other modifications of the waterway is acceptable, provided the waterway remains generally natural and riverine in appearance.
Shoreline Development	Essentially primitive. Little or no evidence of human activity.  The presence of a few inconspicuous structures, particularly those of historic or cultural values, is acceptable.  A limited amount of domestic livestock grazing or hay production is acceptable.  Little or not evidence of past timber harvest. No ongoing timber harvest.	Largely primitive and undeveloped. No substantial evidence of human activity.  The presence of small communities or dispersed dwellings or farm structures is acceptable.  The presence of grazing, hay production, or row crops is acceptable.  Evidence of past or ongoing timber harvest is acceptable, provided the forest appears natural from the riverbank.	Some development. Substantial evidence of human activity.  The presence of extensive residential development and a few commercial structures is acceptable.  Lands may have been developed for the full range of agricultural and forestry uses.  May show evidence of past and ongoing timber harvest.
Water Quality	Meets or exceeds federal criteria or federally approved state standards for aesthetics, for propagation of fish and wildlife normally adapted to the habitat of the river, and for primary contact recreation (swimming) except where exceeded by natural conditions.	No criteria prescribed the Wild and Scenic Rivers Act. The Federal Water Pollution Control Act Amendments of 1972 have made it a national goal that all waters of the United States be made fishable and swimmable. Therefore, rivers will not be precluded from scenic or recreational classification because of poor water quality at the time of their study, provided a water quality improvement plan exists or is being developed in compliance with applicable federal and state laws.	
Accessibility	Generally inaccessible except by trail. No roads, railroads, or other provisions for vehicular travel within the river area. A few existing roads leading to the boundary of the river area is acceptable.	Accessible in places by road. Roads may occasionally reach or bridge the river. The existence of short stretches of conspicuous or longer stretches of inconspicuous roads or railroads is acceptable.	Readily accessible by road or railroad. The existence of parallel roads or railroads on one or both banks as well as bridge crossing and other river access points is acceptable.

Source: The Federal Register, Volume 47, Number 174, September 7, 1982.

# Wild and Scenic River Suitability Assessments

## Introduction

This appendix contains the suitability assessment for the only river segment found eligible for inclusion in the National Wild and Scenic Rivers System in the draft Resource Management Plan/Environmental Impact Statement process. This river segment is segment 2 of the upper Klamath River (from the J.C. Boyle Powerhouse to the Oregon-California state line), which is within State Comprehensive Outdoor Recreation Plan region 9 (see State Comprehensive Outdoor Recreation Plan Map). This map shows the location of this river segment in the planning area.

Segment 3 of the upper Klamath River, which begins where segment 2 ends, was determined suitable through the Redding (California) BLM Final Resource Management Plan (June 1993). The resource values in both segments are similar and would most appropriately be managed together, therefore, the proposed action for segment 3 from the Redding Resource Management Plan is included at the end of the appendix for the reader's information and for comparison with the proposed action for segment 2.

This introduction to the individual suitability assessments, in addition to general background material, contains suitability criteria, information on potential land acquisition, public involvement, a comparison of outstandingly remarkable values for each designated and eligible study river in the State Comprehensive Outdoor Recreation Plan region, and the formula used to determine the theoretic hydroelectric power potential of the upper Klamath River.

The analysis of a river's potential for designation under the National Wild and Scenic Rivers Act involves three separate steps: determining eligibility, establishing classification, and finding of suitability.

The eligibility and classification criteria are described in the previous section of this appendix, called Wild and Scenic River Eligibility and Classification Determinations. To be eligible for designation a river or river segment must be free-flowing and possess at least one outstandingly remarkable value. During the Resource Management Plan/Environmental Impact Statement planning process, ten stream segments were reviewed for determination of eligibility; four were found ineligible (Rock Creek, segment B of Antelope Creek, segment 1 of the upper Klamath River, and East Branch of the Lost River). The eligibility determinations are on file at the Klamath Falls Resource Area office.

For each river segment determined to be eligible, a tentative classification of wild, scenic, or recreational must be established. River area classification is based on the level and extent of development of and accessibility to the river segment at the time of the study. A summary of eligibility and highest potential classification is shown in Chapter 3, Table 3-23.

For each eligible river segment, a finding must be made as to whether it would make a suitable addition to the National Wild and Scenic Rivers System. Suitability findings by alternative were shown in Chapter 2, Table 2-15 of the draft. Criteria specified in section 4(a) of the Wild and Scenic Rivers Act provides a basis for suitability assessment.

These criteria are as follows:

- ◆ The characteristics that do or do not make the area a worthy addition to the system;
- ◆ The current status of land ownership and use in the area;
- ◆ The reasonably foreseeable potential uses of the land and water which would be enhanced, foreclosed, or curtailed if the area were included in the National Wild and Scenic River System;
- ◆ The federal agency that should administer the river;
- ◆ The extent to which the costs thereof would be shared by state and local agencies; and

- ◆ The estimated cost to the United States of acquiring necessary land and interest in land and of administering the area, should it be added to the system.

Once a determination of suitability has been made through the Resource Management Plan process, State Directors have at least four options in dealing with Wild and Scenic River legislative recommendations, which include: (1) encourage the Governor of their respective State to petition the Secretary of the Interior, after enactment of State legislation to protect the applicable river(s), for designation under Section 2(a)(ii) of the Wild and Scenic River Act; (2) encourage members of the respective State Congressional delegation to introduce legislation for designation by amending Section 3(a) of the Wild and Scenic River Act; (3) forward recommendations for designation through the Director and the Secretary as outlined in this Manual Section; and (4) defer any such wild and scenic river recommendation until such time as public support is favorable to designation.

In March 1993, Oregon's Governor petitioned the Secretary of the Interior to designate the Oregon portion of the upper Klamath River through section 2(a) of the National Wild and Scenic Rivers Act. In accordance with Departmental Manual NPS-12, the National Park Service prepared a Draft Environmental Assessment on designation of the river. The Draft went out for public comment, then a Final was prepared based on those comments.

All BLM-administered land within the proposed boundary of the upper Klamath River Canyon will be afforded a level of interim management necessary for protection of identified outstanding remarkable values. This interim management will continue until a determination of nonsuitability is made through the Resource Management Plan or a final decision on designation is made.

The federal government does not manage private land within designated wild, scenic, or recreational river areas and has no zoning authority over these lands under the Act. The federal government's authority to affect private lands is primarily through the acquisition authorities conferred in the National Wild and Scenic Rivers Act. Except for the acquisition of land or interest in lands, for which just compensation is made, the agencies cannot regulate the use of private property via this law. Section 6(b) of the Act prohibits federal condemnation to purchase fee title lands when 50 percent or more of a designated river corridor is public land (federal, state, county, etc.). However, section 6(b) does allow the use of condemnation to purchase scenic easements as a measure of last resort to remove or prevent a threat to the river or its outstandingly remarkable values.

Private land ownership is legitimate within designated river boundaries, and existing private land uses are often consistent with management goals of wild, scenic, or recreational river areas. Carefully conducted ranching, farming, mining, and forest management activities within scenic and recreational river areas may continue. Assistance to private landowners may be provided by the federal government to encourage practices that enhance the river's natural values, for example, water quality and quantity, streambank stability, and riparian habitat.

There has been minimal public comment regarding the suitability of most eligible rivers. The exceptions have been the upper Klamath River, which received extensive public comment, and Barnes Valley Creek, which received a few comments. The strongest feelings against designation of the Klamath River into the National Wild and Scenic River System were in letters from Klamath Falls, while the strongest feelings for designation were in letters from California and other states not including Oregon. In Oregon (excluding Klamath Falls), the sentiment was fairly evenly divided, but leaned slightly more toward designation. A hydroelectric project has been proposed by the City of Klamath Falls on segment 2 of the upper Klamath River. The controversy centers around construction of the hydroelectric project vs designation under the Act. Comments on Barnes Valley Creek centered around the verification of endangered suckers in the creek. The Klamath Falls Resource Area added fish as an outstandingly remarkable value to the Barnes Valley Creek suitability assessment, but continued its recommendation that Barnes Valley Creek is not suitable for inclusion in the National Wild and Scenic Rivers System. Public responses are on file at the Klamath Falls Resource Area office.

Based on planning criteria in the State Director's guidance for formulation of planning alternatives (see Appendix C), the BLM made a comparison of outstandingly remarkable values associated with each eligible river segment in each State Comprehensive Outdoor Recreation Plan region. Rivers were found suitable for designation in the National Wild and Scenic River System in the different alternatives based on whether one or more of its outstandingly remarkable values were ranked among the top four (Alternative D), top two (Alternative C), or top one (Alternative B) river(s) in its State Comprehensive Outdoor Recreation Plan region. Rivers that are already



## Appendix I - Wild and Scenic Rivers

included in the National Wild and Scenic River System were ranked equally as being among the top river(s) in the State Comprehensive Outdoor Recreation Plan region.

Four designated rivers (the Rogue, upper Rogue, Illinois, and North Umpqua) and one Congressionally-mandated study river (the upper Klamath) flow through State Comprehensive Outdoor Recreation Plan region 9 (see the State Comprehensive Outdoor Recreation Plan map in the map packet. Therefore, the outstandingly remarkable values associated with those rivers were ranked above those on non-designated rivers. The top four river areas per outstandingly remarkable value are shown in Table I-2, with the top river(s) listed first. The only segments being studied through this planning process possessing outstandingly remarkable values that rank in the top four for State Comprehensive Outdoor Recreation Plan region 9 are Whiskey and Antelope creeks with prehistoric values. Both the eligibility and suitability determinations were coordinated with all appropriate BLM districts and national forests in the State Comprehensive Outdoor Recreation Plan region.

One indicator of the suitability of a river is its hydroelectric water diversion potential. This potential was determined using the Oregon State University's Water Resources Research Institute's 1979 study entitled, *A Resource Survey of Low-Head Hydroelectric Power Potential in Oregon*. According to that study, the gross theoretical potential hydroelectric power available in any stream reach is determined by the formula:  $P = cQHe$  where:

P = power (kilowatts)  
c = conversion factor = 0.08475  
Q = streamflow (cubic feet per second, cfs)  
H = head (feet)  
e = efficiency = 1.0

Streamflow was determined at the midpoint of the study segment based on available streamflow records and/or from established drainage basin runoff. Head was determined as the total fall in the entire length of the study segment.

Streamflow has to be at least 35 cfs for a reach to be considered to have hydroelectric power potential. In the 1979 study, a stream reach had to have a power potential of 200 kilowatts (kW) at a maximum head of 66 feet, which would correspond to an average annual streamflow of approximately 35 cfs to be included in the study. A common cutoff for BLM waterpower withdrawal review and hydroelectric site evaluations has been 1500 kW at average annual flow, with no head limit. Using an annual average flow of 35 cfs, it would require a head of 500 feet to develop 1500 kW. An annual average flow of 35 cfs is the equivalent of a power output of about 3 kW per foot of head in the study segment. Using 3 kW per foot as a minimum limit, an annual average flow of 35 cfs or more is necessary in the study segment to warrant consideration for hydroelectric power potential in this analysis (Ken St. Mary, OSO Water Power staff, Informal Memorandum February 13, 1992).

This formula and assumption were used for all river segments included in this appendix; therefore, they will not be repeated in each assessment.

Each of the following five suitability assessments contains a summary that identifies the location and finding of the river segment(s) followed by a more detailed description of the river corridor and other factors considered in the suitability determination. For purposes of analysis, all the river segments were found suitable under one or more alternatives and not suitable under the remaining alternatives. The following assessments analyze management of the resources in the river corridor under both scenarios (suitable and not suitable). The suitability finding for each river assessment corresponds to the management action for that river segment(s) described under the Proposed Resource Management Plan in Chapter 2.

**Table I-2. Ranking of Outstanding Remarkable Values in SCORP Region 9.**

River Segment	R <sup>1</sup>	F	G	W	S	P	H	O
Rogue <sup>2</sup>	X		X	X	X		X	
N. Umpqua <sup>2</sup>	X		X		X			X
Upper Rogue <sup>2</sup>		X		X	X			
Upper Klamath <sup>3</sup> , segment 2	X		X	X	X	X	X	X
Illinois	X		X		X			X
Whiskey Creek (to E. and N. forks)							X	
Antelope Creek, segments A and C						X		

<sup>1</sup>Abbreviations used in this table:

R = Recreational G = Geological F = Fish W = Wildlife S = Scenic P = Prehistoric H = Historical

O = Other (such as water quality, hydrological, botanical, vegetation, ecological, biological, and diversity)

<sup>2</sup>River segments previously designated.

<sup>3</sup>Segment 2 of the upper Klamath River ranks in the top 1 or 2 rivers for prehistoric, historic, and other ORVs.

## Upper Klamath River

### Summary

The 11.0-mile segment of upper Klamath River from just below the John C. Boyle Powerhouse to the Oregon-California state line and from rim to rim is found **suitable** for designation as a scenic river under the National Wild and Scenic Rivers Act. The BLM has 75 percent administrative jurisdiction in the upper Klamath River corridor.

### Background

Three segments of the upper Klamath River were studied by the Klamath Falls Resource Area for eligibility, classification, and suitability. This study, documented in the Final Eligibility and Suitability Report for the Upper Klamath Wild and Scenic River Study (1990), was prepared in accordance with section 5(d) of the Wild and Scenic Rivers Act of 1968, which was amended by section 104 of the Omnibus Oregon Wild and Scenic Rivers Act of 1988 (Public Law 100-557, October 28, 1988). An extensive public input process was conducted during the study; a draft study report was published in November 1989. Over 1,000 comments were received and considered during the public comment period, with the draft significantly modified to include the substantive comments, and the final study report was published in April 1990. Most of the information in this suitability assessment was taken from that final study report. If more information is desired, copies of the report are available from the Klamath Falls Resource Area office.

**Description of the River.** The Klamath Falls Resource Area identified as eligible an 11.0-mile river segment (segment 2) from just below the John C. Boyle Powerhouse (river mile 220.3) in section 14, T. 40 S., R. 6 E. to the Oregon-California state line (river mile 209.3) in section 13, T. 41 S., R. 5 E. (see Map 2-E-6). Two other segments of the upper Klamath River were also studied. Segment 1 is the 4.2-mile section from the John C. Boyle Dam (river mile 224.5) to the John C. Boyle Powerhouse (river mile 220.3), and segment 3 is the 5.3-mile section from the Oregon-California state line (river mile 209.3) to the slackwater of Copco Reservoir in California (river mile 204). Segment 1 was determined to be ineligible because of the major modification of the waterway and the significant continuous diversion of water from the Boyle hydroelectric project, which was built in 1958.



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The final study report describes the eligibility finding in detail. Segment 3 was determined eligible. Because it is managed out of the BLM Redding (California) Resource Area office, it is not discussed extensively in Klamath Falls' Resource Management Plan/Environmental Impact Statement. Segment 3 was studied with the Oregon river segments for several reasons; the main reason was because resource values do not stop at state lines. For example, the total recreation value and experience includes both segments 2 and 3. It is mentioned in this suitability assessment when necessary to present the total resource value of the upper Klamath River. The eligibility, classification, and suitability findings of segment 3 are contained in the Final Eligibility and Suitability Report for the Upper Klamath Wild and Scenic River Study. The management objectives are contained in the Redding Resource Area's Final Resource Management Plan (1993) and in the Proposed Action for Section 3 of the Upper Klamath River section of this appendix.

The Klamath River lies within the High Cascades physiographic province and borders the Basin and Range province on the west. Because of its location, there is important biological diversity found within the canyon. Several tributaries and springs flow into the upper Klamath River, including Hayden and Rock creeks. Spencer Creek, another study river in the Klamath Falls Resource Area flows into the river in section 29, T. 39 S., R. 7 E., which is upstream from segment 1. Flows in segment 2 are highly variable due to the year-round releases of water from the John C. Boyle Dam/Powerhouse system. Summer flows typically range from approximately 350 cubic feet per second (cfs) when no water is being released (approximately 1,500 cfs with one generator operating) to approximately 2,500 cfs when both generators are operating. Segment 2 of the upper Klamath River is inhabited by at least 15 known native and introduced fish species. Wild rainbow trout are the primary game fish in the river. Two federal endangered species, the Lost River and shortnose suckers, and a federal candidate category 2 species, the Klamath largescale sucker, occur in the upper Klamath River. Other native species in the river include the Klamath smallscale sucker, blue and tui chub, marbled sculpin, and Pacific lamprey.

The diverse terrestrial habitat within the study area supports a large number of wildlife species (birds, mammals, reptiles, and amphibians) that either reside within the canyon or use the canyon and river habitat to some extent. At least 16 species of raptors, 8 species of waterfowl, 8 upland gamebirds, and 66 non-game birds either reside in the canyon year-round, migrate through, or are seasonal inhabitants. Bald eagles, osprey, prairie falcon, and American kestrel are known to nest in the canyon. Peregrine falcons, a federal endangered species, historically nested and are periodically sighted in the canyon. Wet meadows adjacent to slow moving portions of the river provide feeding, resting, and nesting habitat for several waterfowl species, including Canada geese, wood ducks, common mergansers, Tundra swans, and the double-crested cormorant. Meadows, oak grasslands, and dense brush are important habitats for feeding and brood rearing of upland gamebirds, such as California and mountain quail, wild turkey, and chukar. The diverse plant communities in the canyon provide important nesting, foraging, and wintering habitat to many non-game birds, including robins, juncos, chickadees, and two Oregon state sensitive species (western bluebirds and acorn woodpeckers).

The canyon provides habitat to support a great variety and abundance of mammals. Small mammals, such as bats, rabbits, chipmunks, silver gray squirrels, and other small rodents, are plentiful and provide an abundant prey base for the many predators. Beaver and muskrat are commonly found along the river. The Townsend's big-eared bat, a federal candidate category 2 species is found in segment 2. Bobcat, raccoon, river otter, mink, fisher, ringtails, and long- and short-tailed weasels, which are all predators, inhabit the canyon. Big game mammals occurring in the study area include black-tailed deer, Roosevelt elk, black bear, and cougar. Part of the canyon lies within a larger area designated by the BLM and the Oregon Department of Fish and Wildlife as critical deer winter range.

A total of 28 species of herptiles (reptiles and amphibians) potentially occur within the study area. Talus slopes and rocky hillsides provide good habitat for lizards and den sites for snakes, while amphibians inhabit moist sites around seeps, springs, and along the river. Common reptiles, such as western rattlesnake, gopher snake, western skink, and western toad (among others) are found in the study area along with two Oregon state sensitive species (California mountain kingsnake and western pond turtle [also a federal candidate category 2 species]).

Topography in the study area varies from flat to gently sloping along the river benches to near-vertical basalt cliffs, which rise to 1,000 feet above the water. The upper Klamath River Canyon exhibits unique and diverse plant communities, due in part to the varied topography, aspect, elevation, soil type, and microclimates within the canyon. The Klamath River is one of only three rivers that bisect the Cascade Range (the others are the Columbia River in Oregon and the Pit River in California), cutting through distinct vegetative zones, adding to

the diversity. The major plant communities found in the study area are mixed conifer forest with old growth ponderosa pines, pine/juniper, pine/oak forest, oak forest, and oak/shrub. Meadows and riparian zones occur within the study area, but are small and limited to specific sites and conditions.

The upper Klamath River Canyon is the predominant visual element in the region. The high desert canyon cuts across the southeastern corner of the surrounding plateau. This extensive plateau is characterized by regular rolling topography; whereas, the canyon exhibits considerably more landform variety with cliffs, steep slopes, upland benches, alluvial terraces, and a meandering river channel, all of which can be encompassed in a single view. The canyon was evaluated by the BLM in 1977 and 1981 and received a Scenic Quality Class A evaluation, the highest scenic quality classification. Based on this classification the area was then classified as Visual Resource Management Class II (see the Visual Resources section of Management Direction Common to All Alternatives in Chapter 2 for Visual Resource Management Class objectives).

The study area is rich in cultural resources. Traditional use of the upper Klamath River Canyon by Native Americans began before contact with Euro-americans and continues into the present. Much of the canyon has been surveyed in the last 30 years, initially by the University of Oregon in the early 1960s as prompted by the construction of the John C. Boyle Powerhouse and Dam and more recently by the City of Klamath Falls as part of the proposed Salt Caves hydroelectric project. During these surveys, 45 prehistoric sites were located, including pit house villages, stone rings, lithic scatters, burial sites, a quarry site, and a rock shelter, demonstrating intense prehistoric use of the canyon by Native Americans. This use dates back approximately 7,000 years. The upper Klamath River Canyon has also been used by Euro-americans since the 1850s. Several historic sites remain as a result of this use, including the stagecoach-freight road known as the Topsy Road, Beswick Hotel and Klamath Hot Springs (both in segment 3), livery stops at the Way Station Ranch and Overton Station, Kerwin Ranch, Frain Ranch, Way Cemetery, Topsy School, and a log chute (in segment 3). Today, members of the Klamath Tribe and the Shasta Nation continue to use the canyon for spiritual purposes, hunting, fishing, gathering, and other cultural activities. The river and canyon are considered to be sacred by the Klamath and Shasta, because of historical use by tribal ancestors and present day use by tribal members.

Semi-primitive motorized recreation opportunities (see Appendix J for definition) are available in segment 2 (roaded natural recreation opportunities are available in segment 3). The major recreation activities in the study area include whitewater boating, fishing, hunting, and camping. Additional activities include sightseeing, hiking, photography, picnicking, wildlife observation, driving for pleasure, trapping, off-highway vehicle use, and horseback riding.

**Eligibility Determination.** To be eligible for inclusion in the National Wild and Scenic Rivers System, a river or river segment must be free-flowing and must possess at least one outstandingly remarkable value. The definition of free-flowing and guidelines for what makes a resource outstandingly remarkable can be found in the Wild and Scenic River Eligibility and Classification Determinations section of this appendix. As mentioned previously and explained fully in the Final Eligibility and Suitability Report for the Upper Klamath Wild and Scenic River Study, segment 1 was determined ineligible for inclusion in the National Wild and Scenic River System. Segment 2 of the upper Klamath River is free-flowing (as is segment 3). The outstandingly remarkable values in segment 2 include recreation, wildlife, fish, prehistoric, historic, and scenic values, as well as Native American traditional use. More detailed information and references on the outstandingly remarkable values can be found in the final river study report.

**Recreation.** The outstandingly remarkable recreation value of the river is predominantly related to whitewater boating and fishing. The upper Klamath River offers a variety of high quality year-round whitewater boating opportunities for rafters, canoeists, and kayakers. It provides the only year-round Class III to V rapids (see definitions in Table I-3) in Oregon and northern California, attracting visitors from outside the region who are willing to travel long distances to experience a quality whitewater run. Segment 2 contains more rapids (52), ranging from Class I to V, than most other rivers of the western United States. The first half of segment 2 offers less-technical Class I to III opportunities, while the lower half offers highly technical whitewater boating with 10 Class I to II and 18 Class III to V rapids. The relatively short distance (five river miles) of the lower half of segment 2, combined with the quantity and classification of rapids, provides an experience not found on other rivers in Oregon and northern California. Most of the private boaters are from within the region, and most of the commercial rafting outfitters and their clients are from outside the region, primarily from the San Francisco Bay area and northern California. The Klamath River offers an excellent fishery for wild rainbow trout with a size and

**Table I-3. Whitewater Classification on the Upper Klamath River.**

River Section	Class I <sup>1</sup>	Class II <sup>1</sup>	Number of Rapids		Class V <sup>1</sup>
			Class III <sup>1</sup>	Class IV <sup>1</sup>	
River Mile 220.1 to 214.3 (Boat launch area to Caldera Rapid)	14	9	1	0	0
River Mile 214.3 to 209.3 (Caldera Rapid to state line)	1	9	13	3	2

<sup>1</sup>Rapids are given a difficulty rating of I to VI on the International Scale of River Difficulty, shown below.

**CLASS I EASY**

Moving water with a few riffles and small waves. Few or no obstructions.

**CLASS II EASY TO MEDIUM**

Rapids with waves up to three feet, and wide clear channels. Some maneuvering is required around obvious obstacles.

**CLASS III MEDIUM TO MODERATELY DIFFICULT**

Rapids with high irregular waves, narrow channels, rocks, and holes. Often requires complex maneuvering.

**CLASS IV DIFFICULT TO VERY DIFFICULT**

Long, turbulent rapids with powerful waves and holes. Many obstacles requiring precise, expert maneuvering. Scouting from shore is often necessary.

**CLASS V EXTREMELY DIFFICULT**

Long, technical, and very violent rapids with highly congested routes which always must be scouted from shore. Dangerous drops, unstable eddies, irregular currents, and horrendous holes are often encountered. Requires experience, self-confidence, and good physical condition.

**CLASS VI NEARLY IMPOSSIBLE AND EXTREMELY DANGEROUS**

Difficulties of Class V carried to the extreme of navigability. Mishap could be hazardous to life. For teams of experts only, after close study and with all precautions taken. Generally considered unrunnable for commercial purposes.

Source: Headwaters Commercial Outfitters (1989 Brochure).

catch rate among the highest in the state, which attracts anglers from outside the region. There is nearly unlimited shoreline access. Currently, the upper Klamath River is one of two major rivers in the region that is open to trout angling year-round (with catch-and-release requirements from June 15 to September 30).

**Wildlife.** The combination of numerous wildlife populations and diverse habitats found in segment 2 of the upper Klamath River is not found elsewhere in the region and qualifies as an outstandingly remarkable resource. Including fish, there are five federally and/or State listed threatened or endangered and eight federal candidate category 2 species; nine state sensitive and/or Bureau assessment species; known to occur and an additional seven federal and state listed species potentially occurring within this part of the study area (see Table I-4).

Wildlife habitat within and surrounding this segment is of exceptionally high quality and diversity for the region. The riverine habitat is important to a wide variety of birds and mammals including bald eagles, osprey, ringtail, and river otters. The canyon provides a natural migration corridor for a variety of raptors and the extensive rimrock is important raptor nesting habitat. Five known prairie falcon nest sites, a historic peregrine falcon nest

**Table I-4. Threatened, Endangered, and State Sensitive Fish and Wildlife in the Upper Klamath River Corridor.**

Species	Status		Type of Use	Source
	OR	Federal		
Birds				
Northern Spotted Owl	T	T	R	BLM
Bald Eagle	T	T	N	BLM
Peregrine Falcon	E	E	M,P	ODFW
Northern Goshawk	SS	FC	S,P	ODFW
Northern Pygmy Owl	SS	AS	R	ODFW
Acorn Woodpecker	SS	AS	R	ODFW
Lewis' Woodpecker	SS	AS	R	ODFW
White-headed Woodpecker	SS	AS	R	BLM
Pileated Woodpecker	SS	AS	ID,P	BLM
Pygmy Nuthatch	SS	AS	N	BLM
Western Yellow-billed Cuckoo <sup>1</sup>	SS	3B	ID	Littlefield
Mountain Quail		FC	R	BLM
Mammals				
Pacific Fisher	SS	FC	R	KF
Ringtail	SS	AS	R	KF
Townsend's Big-eared Bat	SS	FC	S	BLM
Wolverine <sup>1</sup>	T	FC	R	ODFW
Herptiles				
Short-horned Lizard <sup>1</sup>	SS		R	St. John
California Mountain Kingsnake	SS	AS	R	St. John
Northwestern Pond Turtle	SS	FC	R	St. John
Tailed Frog <sup>1</sup>	SS	AS	R	St. John
Spotted Frog <sup>1</sup>	SS	FC	R	St. John
Foothill Yellow-legged Frog <sup>1</sup>	SS	AS	R	
Sharptail Snake <sup>1</sup>	SS	AS	R	St. John
Fish				
Slender Sculpin <sup>1</sup>		FC	R	BLM
Lost River Sucker	E	E	R	KF
Shortnose Sucker	E	E	R	KF
Klamath Largescale Sucker <sup>1</sup>	SS	C2	R	KF
Redband Trout	SS	FC	R	ODFW
Invertebrates				
Schuh's Homoplectren Caddisfly		FC	R	ONHP

<sup>1</sup>Species potentially within or near the study area

Abbreviations used in this table:

T = Threatened Species  
 E = Endangered Species  
 FC = Federal Candidate Category 2 Species  
 SS = State Sensitive Species  
 AS = Bureau Assessment  
 N = Nest  
 P = Potential Nest  
 S = Seasonal  
 M = Migrant  
 R = Resident  
 ID = Insufficient Data  
 3B = Taxa which do not meet Endangered Species Act's legal definition of species; future investigation could lead to reevaluation of the listing qualifications.  
 KF = City of Klamath Falls, 1996  
 ONHP = Oregon Natural Heritage Program



## Appendix I - Wild and Scenic Rivers

eyrie, and the high potential for reoccupation or reintroduction of peregrine falcons exists in the canyon. Large live and dead conifers provide nesting and roosting habitat for bald eagles and osprey. Three active bald eagle nest territories and two active osprey nests are found in the canyon. Caves provide important nursery and roosting habitat for several species of bats, including a federal candidate category 2 species (Townsend's big-eared bat). The extensive oak forest and grasslands are important habitat to large numbers of wintering non-game birds, which provide an important avian prey base to migrating and resident raptors.

**Fish.** The highly productive (both in terms of high catch rates of fish up to 20 inches and reproduction rates) native wild rainbow trout population in segment 2 qualifies as an outstandingly remarkable resource. The Klamath River is one of three rivers in the Statewide Comprehensive Outdoor Recreation Plan region and one of only six in Oregon that is designated and managed by the Oregon Department of Fish and Wildlife as a wild rainbow trout fishery. These trout are a naturally spawning population that are genetically unique in being resistant to high pH values; their resistance to a lethal parasite and high summer water temperatures may also be a genetic trait. These inherent characteristics of the Klamath River have been lethal to non-native trout introduced into the river in the past. The Northwest Power Planning Council has designated the upper Klamath River as a Protected Area due to the wild rainbow trout population. The Lost River and shortnose suckers (both federal and state endangered species) and the Klamath largescale sucker (a federal candidate category 2 and state sensitive species) inhabit this segment.

**Prehistoric.** The prehistoric resources in this segment have been determined to be outstandingly remarkable because of the abundance of sites and their regional interpretive value. A high density of prehistoric sites (40 sites) occurs within this 11 mile stretch of the river, demonstrating the intense use of the corridor by Native Americans. Sites include pit house villages; fishing, hunting, and gathering camps; a quarry site; and burial grounds, indicating year-round use of the canyon. The distribution of plant and animal resources of the region in general was such that extensive seasonal movement of people was usually required; therefore, the year-round use of the canyon is exceptional in the region. The wide range of artifacts recovered in the corridor shows that it was used at various times, possibly concurrently, by the Shasta Nation of northern California, the Modoc and Klamath tribes of the Klamath Basin, the Takelma of the upper Rogue River, and possibly the Pit River Indians of northeastern California. The findings raise interesting research questions concerning the timing of the territorial boundary fluctuations, trade relationships between the tribes, and early use of the canyon. All of the sites are eligible for nomination to the National Register of Historic Places as an Archaeological District.

**Historic.** Historic sites in segment 2 are primarily associated with Topsy Road, a historic stagecoach/freight road that extends along 5.1 miles of the canyon. This road, completed in 1890, is an outstandingly remarkable example of an early stagecoach and freight road in its original form. Topsy Road is the only road into the Klamath Basin that was used on a year-round basis. The Way Station, an excellent example of a livery station

**Table I-5. Potential Classification Summary for Upper Klamath River.**

Activity	Wild	Scenic	Recreational
Water Quality	DM	M	M
Water Resources Development	M	M	M
Shoreline Development	DM	M	M
Accessibility	DM	M	M

Abbreviations used in this table:

M = Meets

DM = Does not meet

associated with stage and freight travel, provided year-round services to travelers on the Topsy Road. The two-story log cabin used at this stopover is in good condition. The presence of this historic site, as well as other sites (Way Cemetery, Kerwin Ranch, Frain Ranch, and Topsy School) along the Topsy Road, serve to enhance the historical value of the road.

**Scenic.** The scenic value of the upper Klamath River Canyon has been classified as Scenic Quality Class A, the BLM's highest scenic classification. The outstandingly remarkable scenic value is predominantly due to unique landform, diverse vegetation, water, and lack of negative cultural modifications. The canyon represents a transition from a mountainous to desert landscape as it crosses the Cascade Range, creating the unusual, varied scenery. The steep-walled, layered basalt canyon is the predominant visual element in the region, as the walls of the canyon rise up to 1,000 feet above the river. It cuts across the southeastern corner of the surrounding plateau, exhibiting considerably more landform variety than the plateau. This is due to its steep canyon slopes with large rock outcroppings in the form of vertical basalt cliffs, talus slopes, and rock slides. Vegetative variety, predominantly ponderosa pine with some oak, is much more diverse than the surrounding plateau due to the variety of elevation aspects, and slopes. The canyon provides exceptional opportunities to view wildlife or wildflowers. The area's remoteness and steep topography provides visitors with uncrowded and natural aesthetic experiences. The Klamath River itself enhances the visual variety in the canyon; as it flows through the deep canyon, it changes from slack, slow-flowing water in the wider areas to a rushing torrent of whitewater cascading through narrow rocky walls. Negative cultural modifications, such as roads, powerlines, and developments, are not seen by the casual observer along the river (see discussion in the Classification Determination section of this assessment).

**Native American Traditional Use.** The traditional use of the canyon by Native Americans has been determined to be outstandingly remarkable based on statements by the Klamath Tribe and the Shasta Nation and supporting archaeological and ethnographic evidence that the canyon is sacred and of immeasurable spiritual significance. The spiritual importance of the canyon is associated with the river and canyon's physical environment, as well as ancestral and current use by tribal members. The other outstandingly remarkable values (recreation [fishing], wildlife, fish, prehistoric, historic, and scenic values) form the canyon's physical environment. Because spiritual power is invested in the environment, the preservation of these resources as a whole is vital to Native American religion. The canyon is used by members of two very distinct groups, the Klamath Tribe and the Shasta Nation, for such spiritual activities as vision quests, curing ceremonies, and spiritual preparation; and for cultural activities, including fishing, hunting, gathering, and education. The canyon was also used by ancestors of both groups for burial sites. These sites contribute to the spiritual significance of the canyon because they are places where spiritual leaders or individuals can prepare for specific religious and medicinal ceremonies or communicate with the Great Creator (Hall 1985).

**Classification Determination.** Classification is based on the degree of naturalness and extent of development of the river and its adjacent lands, as they exist at the time of the study, using four criteria: water quality, water resource development, shoreline development, and accessibility. A description of the criteria can be found in the Wild and Scenic River Eligibility and Classification Determinations section of this appendix. The upper Klamath River's highest potential classification is scenic, as shown in Table I-5. Segment 2 is relatively unpolluted, but federally-approved state water quality standards, set by the Oregon Department of Environmental Quality for water in the Klamath River, are occasionally not met. This is especially apparent during periods of low summer flow, when water quality upstream from the study area also does not meet federal standards. The water in the study area is of sufficient quality to support the outstandingly remarkable values. The Oregon Department of Environmental Quality is currently establishing total maximum daily loads for municipalities and industries discharging effluent into the Klamath River. Water quality in rivers classified as scenic or recreational is not required to continually meet or exceed federally approved state standards; therefore, current water quality does not affect its qualifications for inclusion in the National Wild and Scenic Rivers System.

The upper Klamath River is free of any major impoundments, diversions, or other modifications of the waterway. The presence of impoundments above and/or below the segment (including those that regulate the flow regime through the segment, such as is the case with segment 2 of the upper Klamath River) will not by themselves render a river ineligible. There are many river segments in the National Wild and Scenic River System that are downstream from major dams, such as the Rogue River in Oregon and the lower Klamath River in California. Minor rock irrigation diversions (low rock walls that stretch from the shoreline to the center of the river channel and in some instances across the entire river) are the only water resources developments in this segment.



## **Appendix I - Wild and Scenic Rivers**

Shoreline developments include a raft launch area, semi-primitive campsite, several primitive campsites, and remnants of historic activities, which are visible, but not obvious, from the river. Buildings visible from the river include three duplexes and an electric power substation adjacent to the powerhouse, and a historic log cabin in the lower half of segment 2, which is partially screened from view. A U.S. Geological Survey gaging station, which includes a cable strung across the river, a cable car, and a small building that houses the measuring equipment, is visible along a short reach of the river. The river corridor flows through the Ward Pasture of the Edge Creek allotment (#102). Currently, the Ward Pasture is grazed in spring and early summer. A small substation is visible for a short reach of the river in the lower part of segment 2. No timber harvest has occurred in the corridor in the past ten years. However, timber harvest in the canyon has occurred and is visible, but not obvious, from the river. The river corridor would not be available for planned timber harvest during the life of the Resource Management Plan, although salvage harvest would be allowed if necessary.

The main transportation route to the study area is via Highway 66 (Greensprings Highway), an east-west route between U.S. 97 and Interstate 5. The two main access roads to the river begin at Highway 66; Topsy Road generally parallels the east side of the river and John C. Boyle Powerhouse access road parallels the west side of the river. Picard Road from Dorris, California provides access to the Topsy Road from the southeast. The Topsy Road, an improved dirt road, travels high above the river in segment 2; streamside access from this road is available during much of the year at Frain Ranch in section 3, T. 41 S., R. 6 E. The graveled John C. Boyle Powerhouse access road parallels the west side of the river for the entire river segment; however, it is generally far above the river, is inconspicuous, and is rarely visible from the river. Access to the river on the west side is present at the powerhouse (RM 220.3), the BLM raft launch area (¼-mile downstream from the powerhouse), the BLM campsite (river mile 217), Frain Ranch (river mile 215), ¼-mile downstream from Frain Ranch, and across from the Salt Caves (river mile 211.8). The powerhouse access road is generally passable year-round to approximately river mile 213; below that it is only used seasonally due to snow and mud in the winter and spring. Other roads on the west side of the river include a seasonal dirt road that begins above the canyon rim and intersects the powerhouse access road at river miles 211 and 209.5, and a seldom used jeep road that parallels the river between the powerhouse road and the river, between river miles 216.3 and 215. None of the roads in the corridor cross the river. Primary uses of the roads are for recreational activities, such as whitewater boating, fishing, hunting, camping, driving for pleasure, and sightseeing; and for maintenance of the John C. Boyle hydroelectric project facilities.

## **Suitability Factors**

**Current Land Status and Use.** The Klamath Falls Resource Area administers approximately 9 river frontage miles (on both sides of the river), which is 82 percent of the river frontage, and 4,959 acres of the corridor, which is 75 percent of the corridor, as shown in Table I-6.

Land in the Klamath River Canyon is used for energy generation and transmission, recreation, wildlife habitat management, range resources, and Native American traditional use. The study segment lies between two hydroelectric projects, John C. Boyle in Oregon and Copco in California. The John C. Boyle Powerhouse is just outside the northern end of the segment 2 river corridor boundary. Facilities associated with that hydroelectric project that are within the corridor include three duplexes occupied seasonally by employees of Pacific Power and Light, a substation, a gaging station, and access roads. A powerline from the substation at the powerhouse roughly parallels the river for all but approximately 2.5 miles in segment 2. Much of the powerline is in the river corridor, but it is well screened from the river by vegetation and topography. The City of Klamath Falls has an application filed with the Federal Energy Regulatory Commission for the proposed Salt Caves hydroelectric project, which would be in the river corridor. Recreational use activities include whitewater boating, fishing, hunting, camping, sightseeing, hiking, photography, trapping, picnicking, wildlife observation, driving for pleasure, off-highway vehicle use, and horseback riding. The canyon provides habitat that is used extensively for several species of fish and wildlife. The Edge Creek allotment, which extends far beyond the study area, is the only livestock grazing allotment in the corridor. The BLM manages approximately 3,820 acres of that allotment in the corridor, while 980 acres are managed by Pacific Power and Light. The BLM and Pacific Power and Light are working closely to manage this allotment similarly. Currently, the Ward Pasture (part of the Edge Creek allotment) is grazed in spring and early summer. A portion of the Pokegama Wild Horse Management Area lies within the corridor. The Pokegama Wild Horse Herd has been inventoried biannually since 1972 and numbers

**Table I-6. Segment Ownership and Status Within the Upper Klamath River Corridor.**

Ownership	Acres	Percent
BLM		
Public Domain	2,177	33
O&C Lands	2,782	42
State	120	2
Private		
Pacific Power and Light Co.	991	15
Weyerhaeuser Timber Co.	178	3
Private Individuals	366	5
Total	6,614	100

have ranged from 25 horses in 1972 to a high of 42 in 1988. Native Americans, including the Shasta, Modoc, Klamath, Takelma, and possibly the Pit River tribes, have used the Klamath River Canyon at one time or another for approximately 7,000 years, and this traditional use continues into the present. Today members of the Klamath Tribe and the Shasta Nation use the canyon for spiritual purposes, hunting, fishing, gathering, and other cultural activities.

Timber has not been harvested from the river corridor in over ten years and would not be available for planned timber harvest during the life of this plan, although salvage harvest would be allowed if necessary.

There are no existing mining claims or mineral leases in the river corridor. Klamath County has zoned the private lands in the study area for forestry.

**Reasonable Foreseeable Uses of the Land and Water Which Would be Affected By Designation.** Management guidelines and standards for land uses and management practices appropriate for river areas designated under the National Wild and Scenic Rivers Act are described in the first section of this appendix, called Management Guidelines and Standards for National Wild and Scenic Rivers.

Designation as a scenic river area would ensure the canyon would continue to be managed under Visual Resources Management II objectives, which would indirectly enhance or maintain the user's recreational experience. Fish and wildlife habitat would be maintained or enhanced through the long-term protection that would occur as a result of designation. Livestock grazing carrying capacity (animal unit months) would remain the same, but the season of use would decrease slightly. This change would occur regardless of designation. Increased management attention to the Pokeyama Wild Horse Management Area, which could improve the habitat for the herd. The Native American traditional use would benefit the most from designation. The river area would be ensured long-term protection. The land and the river itself are spiritually significant to the Klamath Tribe. Protection of the Klamath River Canyon would allow for the continuation of important spiritual and cultural activities of the Native Americans.

If the river were designated as a recreational river area, BLM management would be similar in most respects to management without designation, but BLM's management presence would increase, diminishing inappropriate uses and thus enhancing the river segment's recreational use. A wider variety of uses and activities could occur under a recreational rather than a scenic designation and therefore a scenic designation would provide the best protection to the outstandingly remarkable values.

Designation as scenic would preclude major diversions, hydroelectric power facilities, water supply or flood control dams, or other major streambank modifications along the river. This would preclude the building of the proposed Salt Caves hydroelectric project. No other management activities that could affect any of the outstandingly remarkable values or free-flowing character of the river would be allowed on BLM-administered land.

## **Appendix I - Wild and Scenic Rivers**

Existing uses, such as recreation and livestock grazing, could continue in the corridor at current levels. Opportunities for solitude would decrease with increased recreational use in the canyon. Increased levels of any uses or activities on BLM-administered land would be curtailed if they could harm the outstandingly remarkable values or free-flowing character of the stream.

**Hydroelectric and Other Water Diversion Potential.** The City of Klamath Falls has an application filed with the Federal Energy Regulatory Commission for the proposed Salt Caves hydroelectric project, which would be located within segment 2 of the upper Klamath River. The hydroelectric project would be very similar to the existing John C. Boyle project. A summary of the project and its impacts are described briefly in Appendix N. The Federal Energy Regulatory Commission's May 1990 environmental impact statement describes alternative hydroelectric projects and their effects. The existence of the application and subsequent environmental impact statement indicates that there is very high potential for hydroelectric power and associated water diversion in segment 2. Because of this, the formula used for the other potentially suitable river segments was deemed unnecessary. Note: The City of Klamath Falls has submitted a new Salt Caves project proposal to the Department of Environmental Quality. Until the BLM sees the new proposal, analysis of effect of that new project are not possible. When a right-of-way application from the City of Klamath Falls is submitted the BLM will analyze the effects of the project for consistency with approved management plans, applicable laws, and regulations.

**Effects on Outstandingly Remarkable Values.** Designation as a scenic river area would ensure the continuation of a variety of recreational opportunities in a high quality, semi-primitive setting. Compatible recreation facilities could be built to enhance the recreational experience. The populations of the various wildlife species would be maintained or enhanced by long-term protection of their habitats. Fish populations and habitats would be maintained by designation. Increased management attention in the canyon would maintain or enhance prehistoric and historic values, depending on the specific actions eventually specified in a river management plan. Designation would ensure long-term protection for the Scenic Quality Class A scenic resources through preservation of the Visual Resource Management Class II management objectives, which are to retain the existing character of the landscape. Many land uses and activities could still occur, but not within sight of the river. Protection of the upper Klamath River and its outstandingly remarkable values would allow for the continuation of Native American spiritual and cultural activities in the canyon in a semi-primitive setting.

If the river was not designated, long-term protection of the upper Klamath River would not be guaranteed. If the proposed Salt Caves hydroelectric project was not built, the outstandingly remarkable values generally would be maintained. If the proposed Salt Caves project were built, the recreation, wildlife, prehistoric, and scenic values, as well as the Native American traditional use of the corridor could be diminished. The following discussion is excerpted from Appendix N, which is a summary of the Federal Energy Regulatory Commission Environmental Impact Statement (1990). The recreational value would be diminished because of the significant change in water flows and presence of project-associated structures in segment 2, both of which would affect the recreational experience and the recreational activity, especially fishing and whitewater boating. Wildlife habitat would be lost or modified on approximately 240 acres. A habitat management program and timing of construction activities have been proposed as mitigation. In the short term (for the life of the plan) wildlife values would be diminished to some degree. Habitat and population of native rainbow trout and shortnose and Lost River suckers would remain unchanged in the short term from construction and operation of the Salt Caves project; however, in the long term, the rainbow trout habitat and population would be enhanced while the sucker habitat and population would be minimally affected. Construction and operation of the Salt Caves project would diminish prehistoric values in the canyon by directly affecting six sites and indirectly affecting six other sites. Although some of those sites are lithic scatters in poor condition, one of the sites in good condition, known as Border Village, consists of 23 house pits, midden (refuse heap), shell fragments, and lithics (flakes from making arrowheads and spear points). This site has regional and national significance and is eligible for nomination to the National Register of Historic Places. Three sites that may be indirectly affected are also potentially eligible for nomination to the National Register. The historic values would not be affected by the hydroelectric project. Vegetation would be removed from approximately 250 acres during project construction; approximately 80 percent of the power conduit system would be buried and therefore would not be visible from the river; the buried conduit route would be visible due to the extensive cut and fill slope disturbance. All of these effects in combination would diminish the outstanding scenic value of the Klamath Canyon. No other proposed or anticipated activities are expected to significantly diminish the outstandingly remarkable values.



**How the River Segment Would Be Managed If It Were Not Designated or If Designated at a Lower Classification.** The upper Klamath River would be managed as an area of critical environmental concern and as a special recreation management area whether or not it were designated as a scenic river area. The outstandingly remarkable values would be afforded short-term, but not necessarily long-term, protection under area of critical environmental concern designation. Management restrictions associated with the area of critical environmental concern designation would include the following. Off-highway vehicle use would be limited to existing roads and trails; land in the area of critical environmental concern would not be available for planned timber harvest, although salvage harvest would be permitted if necessary; livestock grazing would be unrestricted; and mineral leasing would be subject to a no surface occupancy stipulation. Management under the special recreation management area would not be any different or more restrictive than under the area of critical environmental concern. The area of critical environmental concern boundary, except that it begins where the concrete flume/forebay enters the canyon wall, approximately two river miles upstream from the John C. Boyle Powerhouse, and ends just below the state line to include the BLM raft take out. Segment 2 of the upper Klamath River (from the John C. Boyle Powerhouse to the state line and  $\frac{1}{4}$ -mile from the normal high water mark of each bank) has been designated as a State Scenic Waterway as a result of a ballot measure passed by statewide vote in November 1988. A State Scenic Waterway is the state-level equivalent to a National Wild and Scenic River. Private lands and BLM-administered lands to the extent consistent with federal laws and regulations would follow policies described in the Oregon Administrative Rules (Oregon Administrative Rules 736-40-005 to 736-40-095). The Klamath River would be managed with standard riparian management area buffers to protect the riparian zone and fish habitat. Visual Resource Management Class II objectives would be followed.

If the river were designated as a recreational river area, BLM management would be similar to management without designation, but the administrative cost would be higher. Management actions would be less restrictive than those on a scenic river area, which could result in lesser degree of naturalness in the canyon. A description of guidelines and standards for land uses and management practices for scenic and recreational river areas and recreational river areas can be found in the first section of this appendix, called Management Guidelines and Standards for National Wild and Scenic Rivers.

**Cost of Administration.** The basic objective of federal river designation is to maintain the river's existing condition. Any actual or potential threat to an outstandingly remarkable value, together with specific options to remove or mitigate that threat, can only be determined on a case-by-case basis. Because of variable river values, possible threats and protection mechanisms, estimated costs of mitigating that threat will be made in the river management plan required to be completed within three full fiscal years of designation. The largest costs usually are associated with potential actions on private lands within the corridor, where acquisition or other options can be necessary to remove the threat. If the Klamath River were designated under the National Wild and Scenic River Act, no hydroelectric projects or major diversions would be allowed; therefore, such a project would not be considered a threat and no cost would be associated with removing or mitigating that threat.

The estimated cost of preparing a required river management plan for this stream segment would be approximately \$150,000. Annual river management, administration, and monitoring costs are estimated to be approximately \$10,000. Cost estimates for resource protection measures and necessary public use facilities would be determined through the river management planning process, which would occur after Congressional designation.

No state or local agency has come forward and stated they would be willing to share in the cost of administering this river segment should it become part of the system. In light of the financial constraints imposed by Oregon ballot Measure 5, it is unlikely that state or local agencies would share in these costs, even though the upper Klamath River is a state scenic waterway.

**Administering Agency.** If the upper Klamath River were added to the National Wild and Scenic Rivers System, the BLM would continue to manage the land and resources in the river corridor in cooperation with the Pacific Power and Light Company and the Oregon State Parks and Recreation Department, which is how it is currently managed.

## Finding and Rationale

**Finding.** The 11.0-mile segment of the upper Klamath River from just below the John C. Boyle Powerhouse to the Oregon-California state line and from rim to rim is found suitable for federal designation as a scenic river area under the National Wild and Scenic Rivers Act.

**Characteristics Which Do or Do Not Make the Area a Worthy Addition to the System.** The outstandingly remarkable values discussed previously make the upper Klamath River a worthy addition to the National Wild and Scenic Rivers System. The values that are either comparable to or more significant than those same values found on other designated rivers in the National Wild and Scenic River System are now described.

The upper Klamath River is one of only three rivers that crosses the Cascade Mountain range and represents a transition from mountainous to desert landscape. As a result, the scenery of the river compares with, and sometimes exceeds, that of the Rogue River's designated wild and scenic sections.

Native American traditional use, not represented by other rivers in the National Wild and Scenic River System is one of the upper Klamath River's most unique outstandingly remarkable values. At least two distinct groups of Native Americans (the Klamath Tribe and the Shasta Nation) have continually used the river corridor for 7,000 years. Preservation of the river's ecosystem, as well as ancestral and current use by tribal members, predominantly for spiritual and cultural activities, are important aspects of Native American traditional use of the Klamath River Canyon.

The density of prehistoric sites, some dating back 7,000 years, is comparable with those found along the John Day River, which was added to the National Wild and Scenic River System in 1988.

The upper Klamath River is a classic example of a short, highly technical whitewater rafting run. It has more technical rapids (class IV and V) concentrated within a short stretch of river than either the Lower Klamath or Rogue rivers, the two closest designated rivers in the region that provide whitewater rafting (see Table I-3). Class IV and V rapids can be experienced on the upper Klamath River in the late summer and early fall when the Owyhee and Illinois rivers are unrunnable because of low water and when access is limited on the Rogue River because of its very restrictive permit system. The Owyhee and Illinois rivers are two of only three other designated rivers in Oregon with class IV and V rapids.

Wild rainbow trout fishing on the upper Klamath River is rivaled in Oregon only by the Deschutes River, which is in the National Wild and Scenic River System.

Fifteen federal and state threatened or endangered and state sensitive species are found within the river corridor (see Table I-4). Four of these are federal threatened or endangered fish or wildlife species. Not other designated river in the region (Jackson, Josephine, Klamath, and most of Douglas counties) has this concentration of federal threatened or endangered species.

In addition to each individual value, the combination of the outstandingly remarkable values, each with exceptional significance and concentration within such a small area, causes the upper Klamath River and its ecosystem to be a unique contribution to the National system.

The study area is 75 percent managed by the BLM, which enhances the river's suitability for inclusion in the National Wild and Scenic Rivers System. The BLM has been working in close cooperation with Pacific Power and Light, who owns 15 percent of the corridor.

Almost 1,100 comments were received on the Draft Eligibility and Suitability Report for the Upper Klamath Wild and Scenic River Study, published in 1989. Approximately 22 percent of the public comments on the Summary of the Analysis of the Management Situation, published in December 1990, that were received by the end of the comment period, and most of the comments received since then, have been in reference to potential designation of the upper Klamath River. This indicates public interest is high on this issue. The strongest feelings against designation were in letters from Klamath Falls; while the strongest feelings for designation were in letters from California and other states not including Oregon. In Oregon (excluding Klamath Falls), the sentiment was fairly evenly divided, but leaned slightly more toward designation.

Designation of the upper Klamath would not cause any change in existing employment figures, although it would preclude the additional employment and income that would be associated with the construction and operation of the Salt Caves hydroelectric project. Activities on private land would not be affected beyond that under the State Scenic Waterways Act. The greatest positive effect from designation as scenic would be the long-term protection of the outstandingly remarkable values within the river segment. The greatest negative effect would be the restriction on new land uses, developments, and activities that could, if allowed, negatively affect either the outstandingly remarkable values or the free-flowing character of the river.

## **Management Direction for the Upper Klamath River in California**

In 1990, three segments of the upper Klamath River totalling 20.5 miles were studied for their eligibility and suitability for inclusion in the National Wild and Scenic Rivers System. The Klamath Falls Resource Area Resource Management Plan/Environmental Impact Statement reanalyzed the two segments in Oregon (15.2 miles), while the Redding BLM Resource Management Plan/Environmental Impact Statement discussed the 5.3-mile segment, which flows from the Oregon-California border to the backwater of Copco Reservoir in California (river mile 204). The management direction from the Redding Resource Management Plan Record of Decision (June 1993) is as follows:

### **Management Area. Klamath**

#### **Objectives**

1. Maintain the scenic quality of the river corridor.
2. Improve the condition of riparian vegetation to Class II or better.
3. Protect the cultural resources of the river corridor.
4. Improve semi-primitive non-motorized recreation opportunities

#### **Land Use Allocations**

1. This portion of the Klamath River is considered eligible and suitable for inclusion in the National Wild and Scenic Rivers System. All public land in the corridor bounded by the northern canyon rim and within ¼ mile of normal high water along the southern bank will be managed in a manner which will not impair the outstanding remarkable values and consistent with a preliminary classification as "Scenic".
2. Manage area as Semi-Primitive Motorized.
3. Vehicle use is limited to designated roads and trails.
4. Manage area as Visual Resource Management Class II.
5. The river corridor is closed to livestock grazing.
6. Offer public lands within the river corridor for mineral leasing with no surface occupancy.
7. Mineral material disposals are not allowed within the river corridor.
8. Seek administrative transfer of four parcels totaling approximately 520 acres from the Klamath National Forest.
9. Acquire available unimproved lands within the area and/or develop cooperative management agreements with Pacific Power and Light or their successor(s).

#### **Management Actions**

Amend the existing river management plan for the Klamath River above Copco to reflect the Final Eligibility and Suitability Report for the Upper Klamath Wild and Scenic River Study and the recommendations of the Klamath Falls Resource Management Plan.



## *Appendix I - Wild and Scenic Rivers*

### **Rationale for the Klamath Proposed Action**

The upper Klamath River (above Copco) has been determined suitable for inclusion in the National Wild and Scenic Rivers System. The California segment of this corridor possesses characteristics considered appropriate for a classification as "Scenic". If the Oregon segments of the study corridor are included within the National Wild and Scenic Rivers System through the conclusive action of the U.S. Congress, then the relatively short California segment of this same river will be recommended for inclusion. This action will enhance protection of the overall corridor and provide resource management continuity by BLM in both states.

# Appendix J

## Recreation

### Recreation Opportunity Spectrum Classes

The following chart describes each of the six Recreation Opportunity Spectrum classes in terms of experience opportunities; setting opportunities, and activity opportunities. These descriptors provide a general overview of the opportunities included in each class. These overview statements do not describe each class in detail, but rather provide a point of departure from which the planner or manager can develop more precise prescriptions for each class based on specific situations encountered in field operations. The listing of activity opportunities is provided for illustrative purposes. It is not an all-inclusive list of activity opportunities on the public lands.

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#### The Recreation Opportunity Spectrum Class Descriptions

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Opportunity Class	Experience Opportunity	Setting Opportunity	Activity Opportunity
Primitive	Opportunity for isolation from the sights and sounds of people, to feel a part of the natural environment, to have a high degree of challenge and risk, and to use outdoor skills.	Area is characterized by essentially unmodified natural environment of fairly large size. Concentration of users is very low and evidence of other users is minimal. The area is managed to be essentially free from evidence of induced restrictions and controls. Only facilities essential for resource protection are used. No facilities for comfort or convenience of the user are provided. Spacing of groups is informal and dispersed to minimize contacts between groups. Motorized use within the area is not permitted.	Camping, hiking, climbing, enjoying scenery or natural features, nature study, photography, spelunking, hunting (big game, small game, upland birds, waterfowl), ski touring and snowshoeing, swimming, diving (skin and scuba), fishing, canoeing, sailing, and river running (non-motorized craft).

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**The Recreation Opportunity Spectrum Class Descriptions (cont.)**


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<b>Opportunity Class</b>	<b>Experience Opportunity</b>	<b>Setting Opportunity</b>	<b>Activity Opportunity</b>
Semi-Primitive Nonmotorized	Some opportunity for isolation from the sights and sounds of people, but not as important as for primitive opportunities. Opportunity to have high degree of interaction with the natural environment, to have moderate challenge and risk, and to use outdoor skills.	Area is characterized by a predominantly unmodified natural environment of moderate to large size. Concentration of users is low, but there is often evidence of other area users. On-site controls and restrictions may be present, but are subtle. Facilities are provided for the protection of resource values and the safety of users only. Spacing of groups may be formalized to disperse use and limit contacts between groups. Motorized use is not permitted.	Camping, hiking, climbing, enjoying scenery or natural features, nature study, photography, spelunking, hunting (big game, small game, upland birds, waterfowl), ski touring and snowshoeing, swimming, diving (skin and scuba), fishing, canoeing, sailing, and river running (non-motorized craft).
Semi-Primitive Motorized	Some opportunity for isolation from the sights and sounds of people, but not as important as for primitive opportunities. Opportunity to have high degree of interaction with the natural environment, to have moderate challenge and risk, and to use outdoor skills. Explicit opportunity to use motorized equipment while in the area.	Area is characterized by a predominantly unmodified natural environment of moderate to large size. Concentration of users is low, but there is often evidence of other area users. On-site controls and restrictions may be present, but are subtle. Facilities are provided for the protection of resource values and safety of users only. Spacing of groups may be formalized to disperse use and limit contacts between groups. Motorized use is permitted.	Same as the Semi-Primitive Nonmotorized, plus the following: Off-highway vehicle Use (4-WD, dune buggy, dirt bike, snowmobile), power boating.

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## The Recreation Opportunity Spectrum Class Descriptions (cont.)

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Opportunity Class	Experience Opportunity	Setting Opportunity	Activity Opportunity
Roaded Natural	About equal opportunities for affiliation with other user groups and for isolation from sights and sounds of man. Opportunity to have a high degree of interaction with the natural environment. Challenge and risk opportunities are not very important, except in specific challenging activities. Practice of outdoor skills may be important. Opportunities for both motorized and nonmotorized recreation are present.	Area is characterized by a generally natural environment with moderate evidence of the sights and sounds of people. Resource modification and use practices are evident, but harmonize with the natural environment. Concentration of users is low to moderate with facilities sometimes provided for group activity. On-site controls and restrictions offer a sense of security. Rustic facilities are provided for user convenience as well as for safety and resource protection. Conventional motorized use is provided for in construction standards and design of facilities.	All activities listed previously, plus the following: picnicking, rock collecting, wood gathering, auto touring, downhill skiing, snowplay, ice skating, waterskiing and other water sports, hang gliding, interpretive use, rustic resorts and organized camps.
Rural	Opportunities to experience affiliation with individuals and groups are prevalent as is the convenience of sites and opportunities. These factors are generally more important than the natural setting. Opportunities for wildland challenges, risk taking, and testing of outdoor skills are unimportant, except in those activities involving challenge and risk.	Area is characterized by substantially modified natural environment. Resource modification and utilization practices are obvious. Sights and sounds of people are readily evident, and the concentration of users is often moderate to high. A considerable number of facilities are designed for use by a large number of people. Facilities are often provided for specific activities. Developed sites, roads and trails, are designed for moderate to high use. Moderate densities are provided far away from developed sites. Facilities for intensive motorized use are available.	All activities listed previously, plus the following: competitive games, spectator sports, bicycling, jogging, outdoor concerts, and modern resorts.

## The Recreation Opportunity Spectrum Class Descriptions (cont.)

Opportunity Class	Experience Opportunity	Setting Opportunity	Activity Opportunity
Modern Urban	<p>Opportunities to experience affiliation with individuals and groups are prevalent as is the convenience of sites and opportunities. Experiencing the natural environment and the use of outdoor skills are largely unimportant.</p>	<p>Area is characterized by a highly modified environment, although the background may have natural elements. Vegetation is often exotic and manicured. Soil may be protected by surfacing. Sights and sounds of people, on-site, predominate. Large numbers of users can be expected. Modern facilities are provided for the use and convenience of large numbers of people. Controls and restrictions are obvious and numerous. Facilities for high intensity motor use and parking are present with forms of mass transit often available.</p>	<p>All activities listed previously.</p>

# **Appendix K**

## **Proposed Restrictions on Mineral and Energy Exploration and Development Activity**

### **Introduction**

This appendix discusses the leasing stipulations as they will be applied to BLM managed lands in the planning area. Operating standards pertinent to the locatable and salable minerals program are also described. Mineral exploration and development on federal lands must also comply with laws and regulations administered by several agencies of the State of Oregon; however, these specific requirements are not discussed in this document.

Stipulations and operating standards pertaining to the No Action Alternative, Alternatives A through E, and the Preferred Alternative can be found in the Draft Resource Management Plan and Environmental Impact Statement.

### **Leasable Mineral Resources**

#### **Oil and Gas Leasing**

The Mineral Leasing Act of 1920 (as amended) provides that all publicly-owned oil and gas resources be open to leasing unless a specific land order has been issued to close the area. Through the land use planning process, the availability of these resources for leasing is analyzed, taking into consideration development potential and surface resources. Restrictions on oil and gas operations are identified and placed in the leases as notices and stipulations. Oil and gas leases are then issued from the BLM Oregon State Office in Portland. A leasing notice, and specific lease stipulations, for the Proposed Resource Management Plan are listed later in this appendix.

The issuance of a lease conveys to the lessee an authorization to actively explore and/or develop the lease, in accordance with the attached stipulations and the standard terms outlined in the Federal Onshore Oil and Gas Leasing Reform Act. Restrictions on oil and gas activities in the planning area will take the form of timing limitations, controlled surface use, or no surface occupancy stipulations used at the discretion of the Authorized Officer to protect identified surface resources of special concern.

Stipulations will be attached to each lease before it is offered for sale by the field office which reviews the lease tract. The review will be conducted by consulting the direction given in this proposed resource management plan. In addition, all lands administered by BLM within the planning area will be subject to the lease notice as shown on the following pages. Every attempt will be made to place stipulations in the lease and to minimize use of Standard Conditions of Approval attached to the site specific permit. All federal lessees or operators are required to follow procedures set forth by: Onshore Oil and Gas Orders, Notices to Lessees, The Federal Oil and Gas Royalty Management Act (as amended), The Federal Onshore Oil and Gas Leasing Reform Act and Title 43 Code of Federal Regulations, Part 3100.



## **Oil and Gas Operations**

### **Geophysical Exploration**

Geophysical operations may be conducted regardless of whether the land is leased or not. Notices to conduct geophysical operations on BLM surface are received by the resource area. Administration and surface protection are accomplished through close cooperation of the operator and the BLM. Seasonal restrictions may be imposed to reduce fire hazards, conflicts with wildlife, watershed damage, etc. An operator is required to file a "Notice of Intent to Conduct Oil and Gas Exploration Operations" for all geophysical activities on public land administered by BLM. The notice should adequately show the location and access routes, anticipated surface damages, and time frame. The operator is required to comply with written instructions and orders given by the Authorized Officer, and must be bonded. Signing of the Notice of Intent by the operator signifies agreement to comply with the terms and conditions of the notice, regulations, and other requirements prescribed by the Authorized Officer. A pre-work conference and/or site inspection may be required. Periodic checks during and upon completion of the operations will be conducted to ensure compliance with the terms of Notice of Intent, including reclamation.

### **Drilling Permit Process**

The federal lessee or operating company selects a drill site based on spacing requirements, subsurface and surface geology, geophysics, topography, and economic considerations. Well spacing is determined by the authorized officer after considering topography, reservoir characteristics, protection of correlative rights, potential for well interference, interference with multiple use of lands, and protection of the surface and subsurface environments. Close coordination with the State will take place. Written field spacing orders are issued for each field. Exceptions to spacing requirements involving federal lands may be granted after joint State and BLM review.

### **Notice of Staking**

Once the company makes the decision to drill, they must decide whether to submit a Notice of Staking or apply directly for a permit to drill. The Notice of Staking is an outline of what the company intends to do, including a location map and sketched site plan. The Notice of Staking is used to review any conflicts with known critical resource values and to identify the need for associated rights-of-way and special use permits. The BLM utilizes information contained in the Notice of Staking and obtained from the on-site inspection to develop conditions of approval to be incorporated into the application for permit to drill. Upon receipt of the Notice of Staking, the BLM posts the document and pertinent information about the proposed well in the District Office for a minimum of 30 days prior to approval, for review and comment by the public.

### **Application for Permit to Drill**

The operator may or may not choose to submit a Notice of Staking; in either case, an Application for Permit to Drill must be submitted prior to drilling. An application for permit to drill consists of two main parts; a 12 point surface plan which describes any surface disturbances and is reviewed by resource specialists for adequacy with regard to lease stipulations designed to mitigate impacts to identified resource conflicts with the specific proposal, and an 8 point subsurface plan which details the drilling program and is reviewed by the staff petroleum engineer and/or geologist. This plan includes provisions for casing, cementing, well control, and other safety requirements. For the application for permit to drill option, the on-site inspection is used to assess possible impacts, and develop stipulations to minimize these impacts. If the Notice of Staking option is not utilized, the 30 day posting period begins with the filing of the application for permit to drill. Private surface owner input is actively solicited during the application for permit to drill stage.

## **Geothermal Leasing**

The Geothermal Steam Act of 1970 (as amended) provides for the issuance of leases for the development and utilization of geothermal steam and associated geothermal resources. Geothermal leasing and operational

regulations are contained in Title 43 Code of Federal Regulations, Part 3200. Through the land use planning process the availability of the geothermal resources for leasing is analyzed, taking into consideration development potential and surface and subsurface resources. Restrictions on geothermal operations are identified and placed in the leases as stipulations. Geothermal leases are then issued by the BLM Oregon State Office in Portland.

Geothermal resources within a known geothermal resource area are offered by competitive sale. Outside of known geothermal resource areas, leases can be issued non-competitively (over-the-counter). Prior to a competitive lease sale, or the issuance of a non-competitive lease, each tract will be reviewed, and appropriate lease stipulations will be included. The review will be conducted by consulting the direction given in this resource management plan. The issuance of a lease conveys to the lessee authorization to actively explore and/or develop the lease in accordance with regulations and lease terms and attached stipulations. Subsequent lease operations must be conducted in accordance with the regulations, Geothermal Resources Operational Orders, and any Conditions of Approval developed as a result of site-specific National Environmental Policy Act analysis. In the planning area, restrictions in some areas will include timing limitations, controlled surface use, or no surface occupancy stipulations used at the discretion of the Authorized Officer to protect identified surface resources of special concern.

In addition to restrictions related to the protection of surface resources, the various stipulations and conditions could contain requirements related to protection of subsurface resources. These may involve drainage protection of geothermal zones, protection of aquifers from contamination, or assumption of responsibility for any unplugged wells on the lease.

Development of geothermal resources can be done only on approved leases. Orderly development of a geothermal resource from exploration to production involves several major phases that must be approved separately. Each phase must undergo the appropriate level of National Environmental Policy Act compliance before it is approved and subsequent authorization(s) are issued.

## Leasing Notice and Stipulation Summary

On the following pages, the mineral leasing notice and stipulations for the Proposed Resource Management Plan are shown. In addition to the notice and stipulations, the standard leasing terms (Form 3100-11) will be used. The powersite stipulation (Form 3730-1) will be used on lands within powersite reservations.

Stipulations also can include waivers, exceptions, and modifications. Stipulations that involve an issue of major concern can be waived, excepted, or modified only with at least a 30-day public review (43 CFR 3101.1-4). Waiver, exception, and modification are defined as follows:

- ◆ Waiver - The lifting of a stipulation from a lease which constitutes a permanent revocation of the stipulation from that time forward.
- ◆ Exception - This is a one time lifting of the stipulation to allow a permitting activity for a specific proposal. This is a case-by-case exemption. The stipulation continues to apply to all other sites within the leasehold to which the restrictive criteria apply.
- ◆ Modification - This is either a temporary or permanent change to the provisions of a lease stipulation. A modification may, therefore, include an exemption from or alteration to a stipulated requirement. Depending on the specific modification, the stipulation may or may not apply to all other sites within the leasehold to which the restrictive criteria apply.

Throughout the alternatives, the no surface occupancy stipulation is used rather than not leasing, because leasable minerals, if present, can be produced from most, if not all of each of the parcels that are subject to this stipulation without impacting the value(s) needing protection.

Whenever a special stipulation, such as no surface occupancy, timing, controlled surface use, or special status species is used, the need for the special stipulation is described in the objective that follows the stipulation. By

imposing these special stipulations, it has been concluded that less restrictive stipulations would not be adequate to meet the stated objective.

Lease notices are attached to leases in the same manner as stipulations; however, there is an important distinction between lease notices and stipulations. Lease notices do not involve new restrictions or requirements. Any requirements contained in a lease notice must be fully supported by laws, regulations, policies, onshore oil and gas orders, or geothermal resources operational orders.

## **Leasing Notice and Stipulations for the Proposed Resource Management Plan**

### **Leasing Notice (for all leases)**

**Cultural Resources:** An inventory of the leased lands may be required prior to surface disturbance to determine if cultural resources are present and to identify needed mitigation measures. Prior to undertaking any surface-disturbing activities on the lands covered by this lease, the lessee or operator shall:

1. Contact the Bureau of Land Management (BLM) to determine if a cultural resource inventory is required. If an inventory is required, then;
2. The BLM will complete the required inventory; or the lessee or operator, at their option, may engage the services of a cultural resource consultant acceptable to the BLM to conduct a cultural resource inventory of the area of proposed surface disturbance. The operator may elect to inventory an area larger than the standard ten-acre minimum to cover possible site relocation which may result from environmental or other considerations. An acceptable inventory report is to be submitted to the BLM for review and approval no later than that time when an otherwise complete application for approval of drilling or subsequent surface-disturbing operation is submitted.
3. Implement mitigation measures required by the BLM. Mitigation may include the relocation of proposed lease-related activities or other protective measures such as data recovery and extensive recordation. Where impacts to cultural resources cannot be mitigated to the satisfaction of the BLM, surface occupancy on that area must be prohibited. The lessee or operator shall immediately bring to the attention of the BLM, any cultural resources discovered as a result of approved operations under this lease, and shall not disturb such discoveries until directed to proceed by the BLM.

**Authorities:** Compliance with Section 106 of the National Historic Preservation Act is required for all actions which may affect cultural properties eligible to the National Register of Historic Places. Also, compliance with the Archaeological Resources Protection Act and the Native American Graves Protection Act is required. Section 6 of the Oil and Gas Lease Terms (Form 3100-11) requires that operations be conducted in a manner that minimizes adverse impacts to cultural and other resources.

## **Leasing Stipulations**

### **Standard Leasing Terms**

Standard leasing terms for oil and gas are listed in Section 6 of Offer to Lease and Lease for Oil and Gas, Form 3100-11. They are:

Lessee shall conduct operations in a manner that minimizes adverse impacts to the land, air and water, to cultural, biological, visual and other resources, and to other land uses or users. Lessee shall take reasonable measures deemed necessary by lessor to accomplish the intent of this section. To the extent consistent with lease rights granted, such measures may include, but are not limited to, modification to siting or design of facilities,

timing of operations, and specification of interim and final reclamation measures. Lessor reserves the right to continue existing uses and to authorize future uses upon or in the leased lands, including the approval of easements or rights-of-way. Such uses shall be conditioned so as to prevent unnecessary or unreasonable interference with rights of lessee.

Prior to disturbing the surface of the leased lands, lessee shall contact BLM to be apprised of procedures to be followed and modifications or reclamation measures that may be necessary. Areas to be disturbed may require inventories or special studies to determine the extent of impacts to other resources. Lessee may be required to complete minor inventories or short-term special studies under guidelines provided by lessor. If in the conduct of operations, threatened or endangered species, objects of historic or scientific interest, or substantial unanticipated environmental effects are observed, lessee shall immediately contact lessor. Lessee shall cease any operations that would result in the destruction of such species or objects until appropriate steps have been taken to protect the site or recover the resources as determined by BLM in consultation with other appropriate agencies.

Standard terms for geothermal leasing can be found on Offer to Lease and Lease for Geothermal Resources (Form 3200-24), Section 6, and are very similar to those described above for oil and gas leasing.

## **Powersite Stipulation (Form No. 3730-1) (to be used on all lands within powersite reservations.)**

### **Special Leasing Stipulations**

The following special stipulations are to be utilized on specifically designated tracts of land as described below:

#### **Special Status Species (to be attached to all leases)**

##### **Resources: Botany and Wildlife**

Stipulation: Lands within this lease may be within the suitable habitat of the Federal Threatened, Endangered or Proposed Threatened and Proposed Endangered species, either officially listed or proposed for listing as Threatened or Endangered species. These species are listed on Tables 3-22 and 3-23. If it is determined through an environmental review process that these species or their habitat exist within this lease, all future operations will be analyzed and subjected to a U.S. Fish and Wildlife Service or National Marine Fisheries Service Section 7 consultation or conference to ensure the action is not likely to jeopardize the continued existence of the species or result in the destruction or adverse modification of critical habitat.

Lands within this lease may bear some or all of the species listed on Tables 3-22 and 3-23 which have protected status as State Threatened; State Endangered; Federal Candidate; Bureau Sensitive or are within the suitable habitat of these species. These species are protected by BLM policy as described in Manual 6840. All future post-lease operations must be analyzed, utilizing recent field data collected at the proper time of year, to identify the presence of such species. If the field examination indicates that the proposed activity may adversely impact Federal candidate species, technical assistance will be obtained from the Fish and Wildlife Service to insure that the actions will not contribute to the need to list a Federal Candidate as a Federal Threatened or Endangered species. Technical assistance may be obtained from the Fish and Wildlife Service or the National Marine Fisheries Service to ensure that actions will not contribute to the need to list a State threatened, State endangered, or Bureau Sensitive species as a Federal Threatened or Endangered species.

Therefore, prior to any surface disturbing activities or even the use of vehicles off existing roads on this lease, BLM approval is required. This restriction also applies to geophysical activities for which a permit is required. The approval is contingent upon the results of site-specific inventories for any of the above mentioned species. The timing of these inventories is critical. They must be conducted at a time of year appropriate to determine the presence of the species or its habitat. The lessee is hereby notified that the process may take longer than the normal 30 days and that surface activity approvals may be delayed.

If no Federal threatened, Federal endangered, Proposed threatened, or Proposed endangered species, or suitable habitat for such species, are found during the inventories, then no formal Section 7 consultation with the



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Fish and Wildlife Service or the National Marine Fisheries Service will be necessary, and the action will be processed using the procedures found in the applicable Oil and Gas Onshore Orders or Geothermal Resources Operational Orders. However, the lessee is hereby notified that, if any Federal threatened, Federal endangered, Proposed threatened, Proposed endangered, State threatened, State endangered, Federal candidate, or Bureau sensitive species are found during the inventories, or if the actions are proposed in designated or proposed critical habitat, then surface disturbing activities may be prohibited on portions of, or even all of the lease, unless an alternative is available that meets all of the following criteria: (a) The proposed action is not likely to jeopardize the continued existence of a threatened or endangered species; (b) The proposed action is not likely to destroy or adversely modify critical habitat for a threatened or endangered species; (c) The proposed action is consistent with the recovery needs in approved Fish and Wildlife Service or National Marine Fisheries Service recovery plans or BLM Habitat Management Plans for the threatened or endangered species; and (d) The proposed action will not contribute to the need to list species as Federal Threatened or Endangered.

**Objective:** To protect officially listed or proposed threatened or endangered plant or wildlife species; and to ensure that post leasing oil and gas or geothermal operations will not likely contribute to the need to list other special status species as threatened or endangered.

**Exception:** An exception may be granted by the Authorized Officer if it is determined that portions of the area do not have any officially listed or proposed threatened or endangered species, Federal Candidate, State Threatened or Endangered species, or Bureau Sensitive species, or their habitat.

**Waiver:** This stipulation may be waived if the species is declared recovered and is no longer protected under the Endangered Species Act, or if other species found within the lease are no longer considered to be in the Federal Candidate, State Threatened or Endangered, or Bureau Sensitive categories.

### **No Surface Occupancy**

A 30-day public notice period will be required prior to modification or waiver of this stipulation.

**Resource:** Riparian Reserves

**Stipulation:** Surface occupancy and use are prohibited within Riparian Reserves.

**Objective:** To meet the objectives of the Aquatic Conservation Strategy in order to protect the health of aquatic systems and their dependent species, including upland species that benefit from these areas.

**Exception:** An exception to this stipulation may be granted by the authorized officer if the operator submits a plan that demonstrates impacts from the proposed action are acceptable or can be mitigated so that the objectives of the Aquatic Conservation Strategy can be met.

**Modification:** The boundaries of the stipulated area may be modified if the Riparian Reserve boundaries are modified.

**Waiver:** This stipulation may be waived if it is determined that the leasehold no longer contains land that meets Riparian Reserve criteria.

### **No Surface Occupancy**

**Resource:** Bly Sanitary Landfill

**Stipulation:** Surface occupancy and use is prohibited on the Bly Sanitary Landfill Recreation and Public Purposes Act lease.

**Objective:** To protect uses on the existing Recreation and Public Purposes Act lease.

**Exception:** An exception to this stipulation may be granted by the Authorized Officer if the operator submits a plan demonstrating that impacts from the proposed action are acceptable or can be mitigated adequately.

**Modification:** The area affected by this stipulation may be modified by the Authorized Officer if the land use authorization boundaries are modified.

**Waiver:** This stipulation may be waived by the Authorized Officer if all land use authorizations within the leasehold have been terminated, canceled, or relinquished.

### **No Surface Occupancy**

A 30-day public notice period may be required prior to exception, modification, or waiver of this stipulation.

**Resource:** Recreation Sites (Gerber, Topsy, Surveyor Mountain, Klamath River rafting put-in)

**Stipulation:** Surface occupancy and use is prohibited within developed recreation sites.

**Objective:** To protect developed recreation sites.

**Exception:** An exception to this stipulation may be granted by the Authorized Officer if the operator submits a plan demonstrating that impacts from the proposed action are acceptable or can be mitigated adequately.

**Modification:** The boundaries of the stipulated area may be modified by the Authorized Officer if the recreation site boundaries are changed.

**Waiver:** This stipulation may be waived if the Authorized Officer determines that the entire leasehold no longer contains developed recreation areas.

### **No Surface Occupancy**

**Resource:** Progeny test sites (Cold-Johnson, Long Point, Buck Swamp, Gerber Road, and North Willow Spring)

**Stipulation:** Surface occupancy and use is prohibited within progeny test sites.

**Objective:** To protect progeny test sites.

**Exception:** An exception to this stipulation may be granted by the Authorized Officer if the operator submits a plan demonstrating that the impacts from the proposed action are acceptable or can be mitigated adequately.

**Modification:** The boundaries of the stipulated area may be modified by the Authorized Officer if the progeny test site boundaries are changed.

**Waiver:** This stipulation may be waived if the Authorized Officer determines that the entire leasehold no longer contains progeny test sites.

### **No Surface Occupancy**

**Resource:** Native American Religious Sites

**Stipulation:** Surface occupancy and use is prohibited within the Yainax Butte and Olene Native American religious sites.

**Objective:** To protect important Native American religious sites.

**Exception:** An exception to this stipulation may be granted by the authorized officer if, after consultation with the appropriate tribe(s), it has been determined that the proposed action is compatible with the religious use of the site.

**Modification:** The boundaries of the stipulated area may be modified by the authorized officer if the religious site boundaries are changed by the appropriate tribe(s).



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**Waiver:** This stipulation may be waived if the religious sites are abandoned and if, after consultation with the appropriate tribe(s), it is determined that impacts from subsequent surface occupancy are acceptable or can be mitigated adequately.

### **No Surface Occupancy**

A 30-day public notice period will be required prior to exception, modification, or waiver of this stipulation.

**Resource:** Pacific Crest National Scenic Trail Special Recreation Management Area

**Stipulation:** Surface occupancy and use is prohibited within 50 feet of the Pacific Crest National Scenic Trail.

**Objective:** To protect recreational qualities, including scenery, and enhance recreational opportunities.

**Exception:** An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be mitigated adequately.

**Modification:** The area affected by this stipulation may be modified by the authorized officer if it is determined that portions of the area no longer are suitable for inclusion in the special recreational management area.

**Waiver:** This stipulation may be waived by the authorized officer if it is determined that the leased lands no longer qualify for special recreation management area designation.

### **No Surface Occupancy**

A 30-day public notice period will be required prior to exception, modification, or waiver of this stipulation.

**Resource:** Upper Klamath River Area of Critical Environmental Concern

**Stipulation:** Surface occupancy and use is prohibited within the Upper Klamath River Area of Critical Environmental Concern.

**Objective:** To protect historic, cultural, scenic, fisheries, and wildlife resources.

**Exception:** An exception to this stipulation may be granted by the authorized officer if the operator submits a plan demonstrating that impacts from the proposed action are acceptable or can be mitigated adequately.

**Modification:** The boundaries of the stipulated area may be modified if the area of critical environmental concern boundaries are modified.

**Waiver:** This stipulation may be waived if the area of critical environmental concern designation is lifted.

### **No Surface Occupancy**

A 30-day public notice period will be required prior to exception, modification, or waiver of this stipulation.

**Resource:** Miller Creek Area of Critical Environmental Concern

**Stipulation:** Surface occupancy and use is prohibited within the Miller Creek Area of Critical Environmental Concern.

**Objective:** To protect scenic and wildlife resources and natural processes.

**Exception:** An exception to this stipulation may be granted by the authorized officer if the operator submits a plan demonstrating that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: The boundaries of the stipulated area may be modified if the area of critical environmental concern boundaries are modified.

Waiver: This stipulation may be waived if the area of critical environmental concern designation is lifted.

### **No Surface Occupancy**

A 30-day public notice period will be required prior to exception, modification, or waiver of this stipulation.

Resource: Yainax Butte Area of Critical Environmental Concern

Stipulation: Surface occupancy and use is prohibited within the Yainax Butte Area of Critical Environmental Concern.

Objective: To protect natural systems.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan demonstrating that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: The boundaries of the stipulated area may be modified if the area of critical environmental concern boundaries are modified.

Waiver: This stipulation may be waived if the area of critical environmental concern designation is lifted.

### **No Surface Occupancy**

Resource: Spencer Creek Off-Highway Vehicle Closure (This area is within a Riparian Reserve)

Stipulation: Access, travel, and drill site construction will be limited to established roads.

Objective: To protect important scenic, fisheries, and riparian resources.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: The boundaries of the stipulated area may be modified if the authorized officer determines that portions of the area can be occupied without adversely affecting the resource values.

Waiver: None

### **No Surface Occupancy**

A 30-day public notice period will be required prior to exception, modification, or waiver of this stipulation.

Resource: Clover Creek Forest Educational Special Management Area

Stipulation: Surface occupancy and use is prohibited within the Clover Creek Forest Educational Special Management Area.

Objective: To protect an educationally-important natural forest stand.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: This stipulation may be modified if the boundaries of the educational area change, or portions of the educational area can be used without adverse, unmitigable impacts.

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**Waiver:** This stipulation may be waived if it is determined that the leasehold no longer contains important forest-related educational opportunities.

### **No Surface Occupancy**

**Resource:** Surveyor Forest Special Management Area (This area is within a Late-Successional/District Designated Reserve)

**Stipulation:** Surface occupancy and use is prohibited within the Surveyor Forest Special Management Area.

**Objective:** To protect natural processes, scenic and wildlife resources, and educational opportunities.

**Exception:** An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be mitigated adequately.

**Modification:** This stipulation may be modified if the boundaries of the special management area change, or portions of the area can be used without adverse, unmitigable impacts.

**Waiver:** This stipulation may be waived if it is determined that the leasehold no longer contains land that meets special management area criteria.

### **No Surface Occupancy**

**Resource:** Bumpheads Special Management Area

**Stipulation:** Surface occupancy and use is prohibited within the Bumpheads Special Management Area.

**Objective:** To protect geologic and scenic values, and natural systems.

**Exception:** An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be mitigated adequately.

**Modification:** This stipulation may be modified if the boundaries of the special management area change, or portions of the area can be used without adverse, unmitigable impacts.

**Waiver:** This stipulation may be waived if it is determined that the leasehold no longer contains land that meets special management area criteria.

### **No Surface Occupancy**

A 30-day public notice period will be required prior to exception, modification, or waiver of this stipulation.

**Resource:** Old Baldy Research Natural Area

**Stipulation:** Surface occupancy and use is prohibited within the Old Baldy Research Natural Area.

**Objective:** To protect scenic resources and natural processes.

**Exception:** An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be mitigated adequately.

**Modification:** This stipulation may be modified if the boundaries of the research natural area change, or portions of the area can be used without adverse, unmitigable impacts.

**Waiver:** This stipulation may be waived if it is determined that the leasehold no longer contains land that meets research natural area criteria.

## **No Surface Occupancy**

Resource: Alkali Lake Special Management Area (This area is within a Riparian Reserve)

Stipulation: Surface occupancy and use is prohibited within the Alkali Lake Special Management Area.

Objective: To protect wetlands and wildlife habitat.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: This stipulation may be modified if the authorized officers determines that climatic, soil, and moisture conditions are such that seasonal occupancy may be permitted.

Waiver: This stipulation may be waived if it is determined that the leasehold no longer contains wetland values.

## **No Surface Occupancy**

A 30-day public notice period will be required prior to exception, modification, or waiver of this stipulation.

Resource: Tunnel Creek Wetlands Special Management Area (This area is within a Riparian Reserve and/or Late-Successional/District Designated Reserve)

Stipulation: Surface occupancy and use is prohibited within the Tunnel Creek Wetlands Special Management Area.

Objective: To protect natural processes and riparian and wildlife resources.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: This stipulation may be modified if the authorized officers determines that climatic, soil, and moisture conditions are such that seasonal occupancy may be permitted.

Waiver: This stipulation may be waived if it is determined that the leasehold no longer contains wetland values.

## **No Surface Occupancy**

A 30-day public notice period will be required prior to exception, modification, or waiver of this stipulation.

Resource: Late-Successional/District Designated Reserves

Stipulation: No surface occupancy will be allowed within Late-Successional/District Designated Reserves.

Objective: To retain and/or restore old growth forest and habitat diversity.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The area affected by this stipulation may be modified by the authorized officer if it is determined that portions of the area do not include Late-Successional/District Designated Reserves.

Waiver: This stipulation may be waived by the authorized officer if it is determined that the entire leasehold no longer includes Late-Successional/District Designated Reserves.

### **Timing Limitation**

Resource: Wildlife - Bald and Golden Eagle Nest Sites and Nesting Habitat

Stipulation: Surface occupancy and use is prohibited from January 1 to August 15, within mile of known bald and golden eagle nest sites and nesting habitat.

Objective: To protect bald and golden eagle nesting sites and/or nesting habitat.

Exception: An exception may be granted by the Authorized Officer if the operator submits a plan which demonstrates that the proposed action will not affect the bald/golden eagle or its habitat. If the Authorized Officer determines that the action may or will have an adverse effect on the species, the operator may submit a plan demonstrating that the impacts can be mitigated adequately. This plan must be approved by BLM in consultation with the US Fish and Wildlife Service.

Modification: The boundaries of the stipulated area may be modified if the Authorized Officer, in consultation with US Fish & Wildlife Service, determines that portion of the area can be occupied without adversely affecting bald/golden eagle nest sites or nesting habitat.

Waiver: This stipulation may be waived if the Authorized Officer, in consultation with US Fish & Wildlife Service, determines that the entire leasehold can be occupied without adversely affecting bald/golden eagle nest sites or nesting habitat, or if the bald eagle is declared recovered and is no longer protected.

### **Timing Limitation**

Consultation with the Oregon Department of Fish and Wildlife will be required prior to exception, modification, or waiver of this stipulation.

Resource: Wildlife, Critical Deer/Elk Winter Range

Stipulation: Surface use is prohibited from November 20 to April 1 within critical deer/elk winter range. This stipulation does not apply to the operation or maintenance of production facilities.

Objective: To protect critical deer/elk winter range from disturbance during the winter use season, and to facilitate long-term maintenance of deer/elk populations.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: The boundaries of the stipulated area may be modified if the authorized officer determines that portions of the area no longer contain critical winter range. This stipulation can be expanded to cover additional portions of the lease if additional critical habitat areas are identified, or if habitat use areas change. The dates for the timing restriction may be modified if new wildlife use information indicates that the November 20 to April 15 dates are not valid for the leasehold.

Waiver: This stipulation may be waived if the authorized officer determines that the entire leasehold no longer contains critical winter range for deer/elk.

### **Timing Limitation**

Consultation with the Oregon Department of Fish and Wildlife will be required prior to exception, modification or waiver of this stipulation.

Resource: Wildlife - Osprey Nest Sites

Stipulation: Surface occupancy and use is prohibited from May 1 to August 1, within mile of known osprey nest sites.

**Objective:** To protect osprey nest sites.

**Exception:** An exception may be granted by the Authorized Officer if the operator submits a plan which demonstrates that the proposed action will not affect the osprey or its nest site.

**Modification:** The boundaries of the stipulated area may be modified if the Authorized Officer determines that a portion of the area can be occupied without adversely affecting the osprey or its nest site.

**Waiver:** This stipulation may be waived if the Authorized Officer determines that there is no longer osprey nesting habitat on the leasehold.

### **Timing Limitation**

**Resource:** Wetlands (See table 3-19 in Chapter 3 for legal descriptions)

**Stipulation:** Surface occupancy and use is prohibited from November 1 to July 15, on wetlands.

**Objective:** To protect wetland vegetation and wildlife habitat

**Exception:** An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be mitigated adequately.

**Modification:** This stipulation may be modified if the authorized officers determines, on a wetland by wetland basis, that a shorter time limitation will adequately protect the wetland values.

**Waiver:** This stipulation may be waived if it is determined that the leasehold no longer contains wetland values.

### **Timing Limitation**

Consultation with the Oregon Department of Fish and Wildlife will be required prior to exception, modification, or waiver of this stipulation.

**Resource:** Wildlife - Western Sage Grouse lek sites

**Stipulation:** Surface occupancy and use is prohibited from March 1 to May 1 within mile of known western sage grouse lek sites.

**Objective:** To protect lek sites.

**Exception:** An exception may be granted by the authorized officer if the operator submits a plan which demonstrates that the proposed action will not affect the sage grouse or its lek site.

**Modification:** The boundaries of the stipulated area may be modified if the authorized officer determines that a portion of the area can be occupied without adversely affecting the sage grouse or its lek site.

**Waiver:** This stipulation may be waived if the authorized officer determines that there is no longer a lek site on the leasehold.

### **Controlled Surface Use**

**Resource:** Soils, Water

**Stipulation:** Prior to disturbance of slopes over 60 percent, an engineering/reclamation plan must be approved by the authorized officer. Such plan must demonstrate how the following will be accomplished:

- ◆ Site productivity will be restored.
- ◆ Surface runoff will be adequately controlled.



## *Appendix K - Proposed Restrictions on Mineral and Energy Exploration & Development Activity*

- ◆ Off-site areas will be protected from accelerated erosion, such as rilling, gully, piping, and mass wasting.
- ◆ Water quality and quantity will be in conformance with state and federal water quality laws.
- ◆ Surface-disturbing activities will not be conducted during extended wet periods.
- ◆ Construction will not be allowed when soils are frozen.

**Objective:** To maintain soil productivity, provide necessary protection to prevent excessive soil erosion on steep slopes, and to avoid areas having excessive reclamation problems.

**Exception:** An exception to this stipulation may be granted by the Authorized Officer if the operator submits a plan which demonstrates that the impacts from the proposed action are acceptable or can be mitigated adequately.

**Modification:** The area affected by this stipulation may be modified by the authorized officer if it is determined that slopes over 60 percent in the area are not subject to excessive erosion and do not have excessive reclamation problems.

**Waiver:** This stipulation may be waived by the Authorized Officer if it is determined that the entire leasehold does not include slopes over 60 percent.

### **Controlled Surface Use**

**Resource:** Visual Resource Management Class II.

**Stipulation:** All surface-disturbing activities, semipermanent and permanent facilities in Visual Resource Management Class II areas may require special design including location, painting and camouflage to blend with the natural surroundings and meet the visual quality objectives for the area.

**Objective:** To control the visual impacts of activities and facilities within acceptable levels.

**Exception:** None.

**Modification:** None.

**Waiver:** This stipulation may be waived if the Authorized Officer determines that there are no longer Visual Resource Management Class II areas in the leasehold.

### **Controlled Surface Use**

A 30-day public notice period will be required prior to exception, modification, or waiver of this stipulation.

**Resource:** Klamath River Complex Special Recreation Management Area

**Stipulation:** Drill site construction and access within the Klamath River Complex Special Recreation Management Area will be limited to established roadways.

**Objective:** To protect recreational qualities and enhance recreational opportunities.

**Exception:** An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be mitigated adequately.

**Modification:** The area affected by this stipulation may be modified by the authorized officer if it is determined that portions of the area no longer are suitable for inclusion in the special recreational management area.

**Waiver:** This stipulation may be waived by the authorized officer if it is determined that the leased lands no longer qualify for special recreation management area designation.

## **Controlled Surface Use**

Resource: Lower Klamath Hills Wildlife Area

Stipulation: Access, travel, and drill site construction will be limited to established roads.

Objective: To protect important wildlife habitat.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: The boundaries of the stipulated area may be modified if the authorized officer determines that portions of the area can be occupied without adversely affecting the wildlife habitat.

Waiver: This stipulation may be waived if the area no longer considered to contain important wildlife habitat.

## **Controlled Surface Use**

A 30-day public notice period will be required prior to exception, modification, or waiver of this stipulation.

Resource: Upper Klamath River - Segment 2 - Suitable Scenic River

Stipulation: Exploration activities, including drilling and access, within mile of the normal high water mark on each side of the river, or from rim to rim, whichever is greater, will be limited to established roadways.

Objective: To minimize surface disturbance, water sedimentation and pollution, and visual impairment.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: The area affected by this stipulation may be modified by the authorized officer if it is determined that portions of the area no longer are suitable for designation as scenic.

Waiver: This stipulation may be waived by the authorized officer if it is determined that the leased lands no longer contain a river designated as scenic.

## **Controlled Surface Use**

Consultation with the Oregon Department of Fish and Wildlife will be required prior to exception, modification, or waiver of this stipulation.

Resource: Critical deer/elk winter range

Stipulation: New connecting or through roads in critical deer/elk winter range will not be allowed.

Objective: To protect critical deer/elk winter habitat

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan demonstrating that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: A portion or portions of the leased lands can be opened to connecting or through roads if the authorized officer determines the area is no longer effective as habitat and is not used as winter range. This stipulation can be expanded to cover additional portions of the lease if additional critical habitat areas are identified, or if habitat use areas change.

Waiver: This stipulation can be waived if the habitat is no longer effective and is not used as winter habitat anywhere within the leasehold.

### **Controlled Surface Use**

Resource: Stukel Mountain Special Recreation Management Area

Stipulation: Drill site construction and access within the Stukel Mountain Special Recreation Management Area will be limited to established roadways.

Objective: To protect recreational qualities and enhance recreational opportunities.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: The area affected by this stipulation may be modified by the authorized officer if it is determined that portions of the area no longer are suitable for inclusion in the special recreational management area.

Waiver: This stipulation may be waived by the authorized officer if it is determined that the leased lands no longer qualify for special recreation management area designation.

### **Controlled Surface Use**

Resource: Swan Lake Rim Area-Roads

Stipulation: Access, travel, and drill site construction will be limited to established roads in the Swan Lake Rim Area.

Objective: To protect important scenic and wildlife resources, and to enhance recreational opportunities.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be mitigated adequately.

Modification: The boundaries of the stipulated area may be modified if the authorized officer determines that portions of the area can be occupied without adversely affecting the resource values.

Waiver: This stipulation may be waived if the off-road vehicle restriction is no longer needed.

### **Controlled Surface Use**

A 30-day public notice period will be required prior to exception, modification, or waiver of this stipulation.

Resource: Late-Successional/District Designated Reserve Buffers

Stipulation: Drill site construction and access in Late-Successional/District Designated Reserve Buffers within this leasehold will be limited to established roadways.

Objective: To maintain old growth habitat features in areas subject to planned timber harvest.

Exception: An exception to this stipulation may be granted by the authorized officer if the operator submits a plan which demonstrates that impacts from the proposed action are acceptable or can be adequately mitigated.

Modification: The area affected by this stipulation may be modified by the authorized officer if it is determined that portions of the area do not include Late-Successional/District Designated Reserve Buffers.

Waiver: This stipulation may be waived by the authorized officer if it is determined that the entire leasehold no longer includes Late-Successional/District Designated Reserve Buffers.

# **Locatable Minerals Surface Management in the Lake-view District**

The following operational guidelines for mining activities have been compiled to assist the miner in complying with the 43 Code of Federal Regulations 3809, which apply to all mining operations on BLM administered lands. The manner in which the necessary work is to be done will be site specific and all of the following standards may not apply to each mining operation. It is the mining claimant's and operator's responsibility to avoid "unnecessary or undue degradation" and they must perform all necessary reclamation work. Refer to 43 Code of Federal Regulations 3809 for general requirements. The BLM will provide site specific guidelines for some mining proposals.

## **Construction and Mining**

### **Vegetation Removal**

Remove only that vegetation which is in the way of mining activities. On Oregon and California land merchantable timber must be marked by BLM prior to cutting, and may not be used for firewood. The same requirement is recommended for public land. It is recommended that small trees (less than 6 inches diameter at breast height) and shrubs are to be lopped and scattered, or shredded for use as mulch. Trees over 12 inches diameter at breast height should be bucked and stacked in an accessible location unless they are needed for the mining operation.

### **Firewood**

Firewood may not be cut and sold, or used off of the mining claims.

### **Topsoil**

All excavations should have all productive topsoil (usually the top 12 to 18 inches) first stripped, stockpiled and protected from erosion for use in future reclamation. This also includes removal of topsoil before the establishment of mining waste dumps and tailings ponds if the waste material will be left in place during reclamation.

### **Roads**

Existing roads and trails should be used as much as possible. Temporary roads are to be constructed to a minimum width and with minimum cuts and fills. All roads shall be constructed so as not to negatively impact slope stability.

### **Water Quality**

When mining will be in or near bodies of water, or sediment will be discharged, contact the Department of Environmental Quality. It is the operator's responsibility to obtain any needed suction dredging, stream bed alteration, or water discharge permits required by the Department of Environmental Quality or other state agencies. Copies of such permits shall be provided to the Area Manager if a Notice or Plan of Operations is filed.

### **Claim Monuments**

Due to the history of small wildlife deaths, plastic pipe is no longer allowed for lode claim staking pursuant to state law. It is recommended that existing plastic pipe monuments have all openings permanently closed. Upon loss or abandonment of the claim, all plastic pipe must be removed from the public lands, and when old markers are replaced during normal claim maintenance, they are to be either wood posts or stone or earth mounds, consistent with state law.

## **Drill Sites**

Exploratory drill sites should be located next to or on existing roads when possible without blocking public access. When drill sites must be constructed, the size of the disturbance shall be as small as possible in order to conduct drilling operations.

## **Dust and Erosion Control**

While in operation, and during periods of temporary shut-down, exposed ground surfaces susceptible to erosion will need to be protected. This can be accomplished with seeding, mulching, installation of water diversions, and routine watering of dust producing surfaces.

## **Fire Safety**

All State fire regulations must be followed, including obtaining a campfire permit or blasting permit if needed. All internal combustion engines must be equipped with approved spark arresters.

## **Safety and Public Exclusion**

The general public may not be excluded from the mining claim. In the interest of safety, the general public can be restricted only from specific dangerous areas (underground mines, open pits or heavy equipment) by erecting fences, gates and warning signs. It is the operator's responsibility to protect the public from mining hazards. Gates or road blocks may be installed on existing or proposed roads only with the approval of the Area Manager.

## **Occupancy**

All structures/trailers on mining claims must be used for mining purposes (must be reasonably incident to mining) and should be covered by a notice or plan of operation. Use of such a structure for residential purposes not related to mining or for recreation is not authorized.

## **Suction Dredging**

Filing either Notice or Plan of Operations is required for any suction dredge operation where the dredge is equipped with a suction intake hose diameter of greater than four inches, and for all suction dredge operations involving more than one dredge regardless of size. The operator must have the applicable Department of Environmental Quality suction dredge permit prior to starting work, and a copy should be submitted to the Area Manager.

## **Tailings Ponds**

Settling ponds must be used to contain fines and any discharge into creeks must meet the Department of Environmental Quality standards.

## **Trash and Garbage**

Trash, garbage, used oil, etc. must be removed from public land and disposed of properly. Do not bury any trash, garbage or hazardous wastes on public lands. Accumulations of trash, debris, or inoperable equipment on public lands is viewed as unnecessary degradation and will not be tolerated.

## **Cultural and Paleontological Resources**

Operators shall not knowingly alter, injure, or destroy any scientifically important paleontological (fossil) remains or any historical or archaeological site, structure, or object on federal lands. The operator shall immediately bring to the attention of the Area Manager, any paleontological (fossil) remains or any historical or archaeological site, structure, or object that might be altered or destroyed by exploration or mining operations, and shall leave such discovery intact until told to proceed by the Area Manager. The Area Manager shall evaluate the discovery, take action to protect or remove the resource, and allow operations to proceed within 10 working days.



## **Threatened and Endangered Species of Plants/Animals**

Operators shall take such action as may be needed to prevent adverse impacts to threatened or endangered species of plants and animals and their habitat which may be affected by operations. Special status species (federal candidate/Bureau sensitive) of plants and animals, and their habitat, will be identified by the Area Manager, and shall be avoided wherever possible.

## **Reclamation**

Reclamation of all disturbed areas must be performed concurrently with mining, or as soon as possible after mining permanently ceases. Reclamation shall include, but shall not be limited to: 1) saving of topsoil for final application after reshaping of disturbed areas has been completed; 2) measures to control erosion, landslides, and water runoff; 3) measures to isolate, remove, or control toxic materials; 4) reshaping the area disturbed, application of topsoil, and revegetation of disturbed areas, where reasonably practicable; and 5) rehabilitation of fisheries and wildlife habitat. When reclamation of the disturbed area has been completed, except to the extent necessary to preserve evidence of mineralization, the Area Manager must be notified so that inspection of the area can be made.

## **Equipment and Debris**

All mining equipment, vehicles, structures, debris and trash must be removed from the public lands during periods of non-operation and/or at the conclusion of mining, unless authorization from the Area Manager is given to the operator or claimant in writing.

## **Backfilling & Recontouring**

The first steps in reclaiming a disturbed site are backfilling excavations and reducing high walls. Coarse rock material should be replaced first, followed by medium sized material, with fine materials to be placed on top. Recontouring means shaping the disturbed area so that it will blend in with the surrounding lands and minimize the possibility of erosion.

## **Seedbed Preparation**

Recontouring should include preparation of an adequate seedbed. This is accomplished by ripping or disking compacted soils to a depth of at least six inches in rocky areas and at least twelve inches in less rocky areas. This should be done following the contour of the land to limit erosion. All stockpiled settling pond fines, and then topsoil, are spread evenly over the disturbed areas.

## **Fertilizer**

The Area Manager must be contacted to determine if fertilization will be necessary, and if so, the type and rate of application.

## **Revegetation**

An Area Manager-approved revegetation prescription must be used to provide adequate revegetation for erosion control, wildlife habitat, and productive secondary uses of public lands.

## **Mulch**

As directed by the Area Manager, during review of the Notice or Plan of Operations, the disturbed area may require mulching during interim or final reclamation procedures. Depending on site conditions, the mulch may need to be punched, netted, or blown on with a tackifier to hold it in place. In some cases, erosion control blankets may be cost effective for use.



## **Roads**

After mining is completed, all new roads shall be reclaimed, unless otherwise specified by the Area Manager. High wall and cutbanks are to be knocked down or backfilled to blend with the surrounding landscape. Remove all culverts from drainage crossings and cut back the fill to the original channel. The roadbed should be ripped to a minimum depth of twelve inches to reduce compaction and provide a good seedbed. The road must then be fertilized and seeded if necessary. When necessary, waterbars are to be used to block access and provide drainage.

## **Tailings Ponds**

The ponds should be allowed to dry out and the fines removed and spread with the topsoil, unless the fines contain toxic materials. If the ponds contain toxic materials, a plan will be developed to identify, dispose, and mitigate effects of the toxic materials. If necessary, a monitoring plan will also be implemented. The ponds should then be backfilled and reclaimed.

# **Guidelines for Development of Salable Mineral Resources in the Lakeview District**

## **Proposed Operations**

All proposed pits and quarries, and any exploration that involves surface disturbance, are required to have operating and reclamation plans that must be approved by the Area Manager. All proposals will undergo the appropriate level of review and compliance with the National Environmental Policy Act.

## **Operating Procedures**

Where practicable, the following requirements should be made a part of every contract or permit providing for the use of mineral material sites on the district:

- ◆ Oversized boulders shall not be wasted but shall be broken and utilized concurrently with the excavated material.
- ◆ The operator shall comply with local and state safety codes covering quarry operations, warning signs and traffic control. All necessary permits must be obtained from state and county agencies.
- ◆ Use of the site for equipment storage and stockpiling rock material is allowed for the duration of the contract or permit. Use of the site beyond that time would be authorized under a special use permit.
- ◆ All topsoil shall be stockpiled or windrowed, as appropriate, for use in reclamation.
- ◆ Prior to abandonment, all material sites will be graded to conform with the surrounding topography. Oversize material that is not usable, and reject, will be placed in the bottom of the pit, graded, and the pit floor and cutlopes covered with topsoil. Reseeding, if necessary, will be done as prescribed by the Area Manager. Access roads no longer needed by the BLM will be abandoned and reclaimed as directed by the Area Manager.

## **Quarry Design**

Where in steep terrain in the operating area, quarry developments will require a series of benches to effectively maximize the amount of mineral materials to be removed in a safe manner. In most cases, bench height should not exceed forty feet, and if the bench will be used by bulldozers to access other parts of the quarry, the width of the bench should be at least twenty-five feet. If the bench is not used by equipment, then this width can be reduced to approximately ten feet.

Clearing of timber and brush should be planned at least ten feet beyond the edge of the excavation limit. Most often the brush will be piled and burned at the site, or scattered nearby.

If at all possible, all topsoil and overburden should be stockpiled and saved for eventual quarry site reclamation. These piles may need to be stabilized by seeding in order to minimize erosion during the winter months.

As a standard procedure, the excavation of the quarry floor should be designed with an outslope of approximately three percent in order to provide for adequate drainage of the floor. Compliance with this design should be made a requirement of all operators at the site.



# Appendix L

## Grazing Management

### Introduction

This appendix has six major sections: Livestock Grazing Allotments, Potential Range Improvements by Allotment, Selective Management, Rangeland Monitoring and Evaluation, General Allowable Use Guidelines, and Grazing in Riparian-Wetland Areas.

### Livestock Grazing Allotments

The following tables summarize multiple-use information for each allotment in the resource area. Pertinent information is organized in four general sections: Allotment Identification, Grazing Administration, Identified Resource Conflicts/Concerns and Management Objectives, and Constraints.

**Allotment Identification.** This section of the tables identifies each allotment by name and allotment number. The Selective Management Category (M,I,C) is identified (See the section Selective Management for more information), type of livestock authorized, and acreage within the allotment (public and private) is provided.

**Grazing Administration Information.** This section provides basic information on the grazing license and other forage demands within the allotment including active preference, suspended nonuse, total preference, exchange-of-use, current season-of-use (No Action) and proposed season-of-use (Proposed Resource Management Plan), and estimated average forage use by major wildlife grazing species. All changes to these and other attributes of livestock grazing management will be made through the monitoring and evaluation process as outlined in the section Rangeland Monitoring and Evaluation.

Based on the preliminary evaluation of vegetative monitoring information by an interdisciplinary team, the following livestock grazing reductions are proposed as part of the Proposed Resource Management Plan (Allotments are listed by number, name, and category; the numbers reflect the animal unit months proposed reduction). The actual evaluation and implementation of these proposed reductions will be as outlined in the section Rangeland Monitoring and Evaluation and the applicable policies and regulations.

#### Stukel Mountain

0815 Stukel-Dehlinger (I)	90
0822 Jeld Wen (I)	60
0852 Rodgers (I)	74
0859 Cunard (I)	20

#### Gerber Block

0876 Bear Valley (I)	75
0889 Timber Hill (I)	145
0890 Willow Valley (I)	220

**Identified Resource Conflicts/Concerns and Management Objectives.** This section of the tables presents the major resource conflicts or concerns that have been identified in each allotment through public input and internal interdisciplinary team interactions. For each conflict/concern identified, a general management objective for its resolution has been developed. This section forms the basis for establishing or revising Allotment Management Plans (or equivalent) and for the further quantification of grazing related objectives during the Implementation period for the Proposed Resource Management Plan. Upon completion of an Ecological Site Inventory on the Klamath Falls Resource Area, ecological status related objectives will be developed for all allotments. (an Ecological Site Inventory is currently not scheduled until after 1999.)

This section of the tables also forms the basis for the direct integration of other pertinent resource values into the allotment monitoring and evaluation process. The grazing use objectives and direction found in the section General Allowable Use Guidelines and Appendix F, best management practices will apply, as applicable, to all of the allotments within the resource area. The information in those sections/appendices is, thus, not reiterated in each allotment table.

**Constraints.** This section of the tables presents information and multiple-use constraints that may influence the nature and degree of change that can be implemented on the allotment through grazing management adjustments, rangeland improvements, or other potential management actions. This section also includes the identification of known areas that are excluded from general livestock grazing (that is riparian exclosures) for resource enhancement purposes. Note that this exclusion designation is not all inclusive, in that additional areas may be designated in the future. Conversely, any generally excluded area may be grazed in the future, as needed, to achieve specific resource objectives.

Potential Range Improvements at the end of the allotment tables section is a summary of the planned potential range improvements by allotment. This table, entitled Potential Range Improvements by Allotment outlines the types, numbers, and estimated costs of improvements that could reasonably be predicted at the time of issuance of this Proposed Resource Management Plan. During the life of the plan it is expected that some additional new projects will arise and that some of the listed potential projects will not be completed.

Over time, changes, additions, and adjustments to the tables in this appendix will be made through the Resource Area's Rangeland Program Summary Update found in the annual Planning Update. This summary will also outline pertinent accomplishments within the grazing and wild horse management programs, range improvements proposed and completed, changes/additions/adjustments to grazing related objectives, grazing management changes, allotment evaluation and activity planning results and efforts, and other grazing related items as they occur.

# **Listing by Allotment Number**

Allotment Number	Allotment Name
0101	Chase Mountain
0102	Edge Creek
0103	Buck Mountain
0104	Buck Lake
0105	Johnson Prairie
0107	Dixie
0140	Dry Lake
0141	Chicken Hills
0142	Long Lake
0147	Grubb Springs
0800	Adams
0801	Haught
0802	Stock Drive
0803	J. Spring
0804	Bar CL
0805	SE 80
0806	Two Mile
0807	Barnwell
0808	Lee
0809	Brown
0810	Brenda
0811	Cheyne
0812	Stukel-Coffin
0813	Plum Hills
0814	Cunningham
0815	Stukel-Dehlinger C.
0816	Stukel-Dehlinger H.
0817	Drew
0818	Duncan
0819	Dupont
0820	Flesher
0821	North Horsefly
0822	Jeld-Wen
0823	North Horsefly
0824	Jeld-Wen
0825	Naylox
0826	Haskins
0827	Stukel-High
0828	Stukel-Hill
0829	Horton
0830	Hungry Hollow
0831	Warlow
0832	Jespersion
0833	Johnson
0834	Kellison
0835	Ketcham
0836	Harpold Chaining
0837	Bryant-Horton
0838	Windy Ridge

Allotment  
Number

Allotment  
Name

0839	Bryant-Loveness
0840	Bryant-Lyon
0841	Marshall
0842	Masten
0843	McAuliffe
0844	Paddock
0845	K-Hills-O'Connor
0846	OK
0847	Swede Cabin
0848	Pope
0849	Rajnus Bros.
0850	Wilkinson
0851	Harpold Ridge
0852	Rodgers
0853	7C
0854	Jump
0855	Bryant-Smith
0856	Bryant-Stastry
0857	Taylor
0858	Swan Lake Rim
0859	Cunard
0860	McCartie
0861	Yainax Butte
0862	Klamath Forest Estate
0863	Wirth
0864	Rajnus & Son
0865	Mills Creek
0876	Bear Valley
0877	Bumpheads
0878	Campbell
0879	Devaul
0881	Goodlow
0882	Horsefly
0883	Horton
0884	Pankey Basin
0885	Dry Prairie
0886	Horse Camp Rim
0887	Pitchlog
0888	Rock Creek
0889	Timber Hill
0890	Willow Valley
0892	Williams
0893	Fields
0894	Voight
0895	Harpold Canyon
0896	McFall





# Management Summaries By Allotment

Allotment Name: Chase Mountain  
Allotment Number: 0101  
Public Acres: 8,823

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 19,680

## Grazing Administration Info. (AUMs)

Active Preference: 195  
Suspended Nonuse: 0  
Total Preference: 195  
Exchange of Use: 239  
Total: 434

## Other Forage Demands (AUMs)

Deer: 1,681  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 1,681

## Season of Use:

PRMP: 5/15 - 8/13  
No Action: 5/15 - 8/13

## Identified Resources Conflicts/Concerns

None

## Management Objectives

## Constraints

The grazing lease for BLM lands (and the exchange of use listed) within this allotment is dependent on and tied to the intermingled private land grazing lease (Weyerhaeuser Company).

Allotment Name: Edge Creek  
(Ward, Edge Creek & North Pastures)  
Allotment Number: 0102  
Public Acres: 8,860

Management Category: I  
Livestock Kind: Cattle  
Other Acres: 29,400

## Grazing Administration Info. (AUMs)

Active Preference: 207  
Suspended Nonuse: 0  
Total Preference: 207  
Exchange of Use: 349  
Total: 556

## Other Forage Demands (AUMs)

Deer: 1,681  
Elk: 100  
Antelope: 0  
Horses: 100  
Total: 1,881

## Season of Use:

### Ward

PRMP 5/1 - 7/1  
No Action 5/1 - 7/15

### Edge Creek & North

PRMP 5/1 - 9/1  
No Action 5/1 - 9/15

## *Appendix L - Grazing Management*

### **Identified Resources**

#### **Conflicts/Concerns**

Under current management the range condition, level or pattern of utilization, and/or season-of-use may be unacceptable; or carrying capacity may be exceeded.

Large area that is not included in allotment but grazed in common with the Ward Pasture.

Critical deer winter range occurs in allotment.

Special status species and/or habitat exists within the allotment.

Riparian or aquatic habitat is in less than good habitat condition.

Water quality may not currently meet the Department of Environmental Quality water quality standards for beneficial use.

River segment under study for inclusion in the National Wild and Scenic River System.

Potential Area of Critical Environmental Concern (ACEC) within this allotment.

Allotment makes up a large portion of the Pokegama Herd Management Area.

Potential for grazing/recreation conflicts within the allotment.

### **Management**

#### **Objectives**

Maintain or improve rangeland condition and productivity through a change in grazing management practices, timing, and/or level of active use.

Include south and east side of Klamath River Canyon in Edge Creek allotment and Ward Pasture.

Management systems should reflect the importance of deer winter range.

Prevent significant risk to well-being of special status species and/or habitat from BLM-authorized actions.

Maintain and improve riparian or aquatic habitat in good or better habitat condition.

Maintain and improve water quality on public lands to meet or exceed standards for beneficial uses, as specifically established by the Department of Environmental Quality, where BLM authorized actions are having a negative effect on water quality.

Ensure livestock grazing management within the river corridor conforms with the river management plan if Congressional approval of river segment occurs.

If designated, grazing management will be consistent with the ACEC management plan.

Manage wild horse grazing levels on public lands to ensure a thriving natural ecological balance and prevent deterioration of the range.

Grazing management should consider recreation concerns.

---

### **Constraints**

Officially listed threatened or endangered species and/or critical habitats occur within allotment. Mitigate all management practices, as needed, to ensure full compliance with the recovery plan in effect for the species in question.

Critical deer winter range occurs in allotment. Vegetation conversions must be coordinated to adequately address the needs of both big game and cattle. No more than 10 percent of current browse in deer winter range may be converted in any one year.

Allotment contains all or a portion of a wild horse herd management area. Management actions must be mitigated, as needed, to ensure the free-roaming nature of the herd.

Ensure that substantial vegetation conversions do not significantly reduce the variety of plant species or communities in abundances necessary for their continued existence and proper functioning.

The grazing lease for the BLM lands (and the exchange of use) within the North and Edge Creek pastures is dependent on and tied to the intermingled private land grazing lease (Weyerhaeuser Company).

The following areas are excluded from general livestock grazing: The upper and lower Hayden Creek Riparian Enclosures and Fox Lake.

Allotment Name:	Buck Mountain	Management Category:	C
Allotment Number:	0103	Livestock Kind:	Cattle
Public Acres:	Medford District* 1,120	Other Acres:	Medford* 8,420
	Lakeview District 7,022		Lakeview 33,300
	<b>Total 8,142</b>		<b>Total 41,720</b>

\*These acres are within the Medford District boundary but licensed for grazing by the Klamath Falls Resource Area, Lakeview District.

#### Grazing Administration Info. (AUMs)

Active Preference:	204
Suspended Nonuse:	0
Total Preference:	204
Exchange of Use:	948
<b>Total:</b>	<b>1,152</b>

#### Other Forage Demands (AUMs)

Deer:	1,643
Elk:	0
Antelope:	0
Horses:	0
<b>Total:</b>	<b>1,643</b>

#### Season of Use:

PRMP	5/15 - 9/1
No Action	5/15 - 10/1

#### Identified Resources Conflicts/Concerns

Under current management the range condition, level or pattern of utilization, and/or season-of-use may be unacceptable; or carrying capacity may be exceeded.

No forage allocations for elk use in the allotment have been made.

Riparian or aquatic habitat is in less than good habitat condition.

Potential for grazing/recreation conflicts within the allotment.

#### Management Objectives

Maintain or improve rangeland condition and productivity through a change in grazing management practices, timing, and/or level of active use.

Allocate forage to meet elk forage demands.

Maintain and improve riparian or aquatic habitat in good or better habitat condition.

Grazing management should consider recreation concerns.

#### Constraints

The grazing lease for BLM lands (and the exchange of use listed), within this allotment is dependent on and tied to the intermingled private land grazing lease (Weyerhaeuser Company).

## Appendix L - Grazing Management

Allotment Name: Buck Lake  
Allotment Number: 0104  
Public Acres: 11,971

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 4,380

---

### Grazing Administration Info. (AUMs)

Active Preference: 280  
Suspended Nonuse: 0  
Total Preference: 280  
Exchange of Use: 169  
Total: 449

### Other Forage Demands (AUMs)

Deer: 2,129  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 2,129

---

### Season of Use:

PRMP 6/15 - 9/15  
No Action 7/1 - 10/15

---

### Identified Resources Conflicts/Concerns

Under current management the range condition, level or pattern of utilization, and/or season-of-use may be unacceptable; or carrying capacity may be exceeded.

No forage allocations for elk use in the allotment have been made.

Riparian or aquatic habitat is in less than good habitat condition.

Water quality may not currently meet the Department of Environmental Quality water quality standards for beneficial use.

Potential for grazing/recreation conflicts within the allotment.

### Management Objectives

Maintain or improve rangeland condition and productivity through a change in grazing management practices, timing, and/or level of active use.

Allocate forage to meet elk forage demands.

Improve and maintain riparian or aquatic habitat in good or better habitat condition.

Maintain and improve water quality on public lands to meet or exceed standards for beneficial uses, as specifically established by the Department of Environmental Quality, where BLM authorized actions are having a negative effect on water quality.

Grazing management should consider recreation concerns.

---

### Constraints

Multiple use management of the allotment has been and will continue to be directed and adjusted via the Spencer Creek coordinated resource management planning (CRMP) process currently in place.

---

---

Allotment Name: Johnson Prairie  
Allotment Number: 0105  
Public Acres: 120

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 400

---

**Grazing Administration Info. (AUMs)**

Active Preference: 12  
Suspended Nonuse: 0  
Total Preference: 12  
Exchange of Use: 0  
Total: 12

**Other Forage Demands (AUMs)**

Deer: 0  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 0

---

**Season of Use:**

PRMP 5/1 - 10/1  
No Action 5/1 - 10/31

---

**Identified Resources**

**Conflicts/Concerns**

None

---

**Management**

**Objectives**

---

---

Allotment Name: Dixie  
Allotment Number: 0107  
Public Acres: Medford District\* 3,260  
Lakeview 2,287  
Total 5,547

Management Category: I  
Livestock Kind: Cattle  
Other Acres: Medford\* 14,060  
Lakeview 8,200  
Total 22,260

\*These acres are within the Medford District boundary but licensed for grazing by the Klamath Falls Resource Area, Lakeview District.

---

**Grazing Administration Info. (AUMs)**

Active Preference: 415  
Suspended Nonuse: 0  
Total Preference: 415  
Exchange of Use: 259  
Total: 674

**Other Forage Demands (AUMs)**

Deer: 928  
Elk: 100  
Antelope: 0  
Horses: 50  
Total: 1,078

---

**Season of Use:**

PRMP 5/15 - 9/15  
No Action 5/1 - 10/1

---

**Identified Resources**

**Conflicts/Concerns**

Under current management the range condition, level or pattern of utilization, and/or season-of-use may be unacceptable; or carrying capacity may be exceeded.

---

**Management**

**Objectives**

Maintain or improve rangeland condition and productivity through a change in grazing management practices, timing, and/or level of active use.



## Appendix L - Grazing Management

Critical deer winter range occurs in allotment.

Management system should reflect the importance of deer winter range.

Riparian or aquatic habitat is in less than good habitat condition.

Improve and maintain riparian or aquatic habitat in good or better habitat condition.

Water quality may not currently meet the Department of Environmental Quality water quality standards for beneficial use.

Maintain and improve water quality on public lands to meet or exceed standards for beneficial uses, as specifically established by the Department of Environmental Quality, where BLM authorized actions are having a negative effect on water quality.

Allotment comprises a large portion of the Pokegama Herd Management Area.

Manage wild horse grazing levels on public lands to ensure a thriving natural ecological balance and prevent deterioration of the range.

---

### Constraints

Officially listed threatened or endangered species and/or critical habitats occur within allotment. Mitigate all management practices, as needed, to ensure full compliance with the recovery plan in effect for the species in question.

Critical deer winter range occurs in allotment. Vegetation conversions must be coordinated to adequately address the needs of both big game and cattle. No more than 10 percent of current browse in deer winter range may be converted in any one year.

Allotment contains all or a portion of a portion of a wild horse herd management area. Management actions must be mitigated, as needed, to ensure free-roaming nature of the herd.

Ensure that substantial vegetation conversions do not significantly reduce the variety of plant species or communities in abundances necessary for their continued existence and proper functioning.

The exchange of use figure listed within this allotment is dependent on the renewal of the private land grazing lease (Weyerhaeuser Company).

The following area is excluded from general livestock grazing: Dixie Riparian Enclosure.

---

Allotment Name:	Dry Lake
Allotment Number:	0140
Public Acres:	145

Management Category:	C
Livestock Kind:	Cattle
Other Acres:	1,040

---

### Grazing Administration Info. (AUMs)

Active Preference:	10
Suspended Nonuse:	0
Total Preference:	10
Exchange of Use:	145
Total:	155

### Other Forage Demands (AUMs)

Deer:	10
Elk:	0
Antelope:	0
Horses:	0
Total:	10

---

**Season of Use:**

PRMP	5/1 - 6/30
No Action	5/1 - 6/30

---

**Identified Resources**  
**Conflicts/Concerns****Management**  
**Objectives**

None

---

**Constraints**

The grazing lease for BLM lands (and the exchange of use listed) within the allotment is dependent on and tied to the intermingled private land grazing lease (Weyerhaeuser Company).

---

Allotment Name:	Chicken Hills
Allotment Number:	0141
Public Acres:	3,422

Management Category:	C
Livestock Kind:	Cattle
Other Acres:	5,340

---

**Grazing Administration Info. (AUMs)****Other Forage Demands (AUMs)**

Active Preference:	80
Suspended Nonuse:	0
Total Preference:	80
Exchange of Use:	383
Total:	463

Deer:	931
Elk:	0
Antelope:	0
Horses:	0
Total:	931

---

**Season of Use:**

PRMP	5/15 - 8/1
No Action	5/15 - 9/15

---

**Identified Resources**  
**Conflicts/Concerns****Management**  
**Objectives**

Under current management the range condition, level or pattern of utilization, and/or season-of-use may be unacceptable; or carrying capacity may be exceeded.

Maintain or improve rangeland condition and productivity through a change in grazing management practices, timing, and/or level of active use.

---

Appendix L - Grazing Management

Allotment Name: Long Lake  
Allotment Number: 0142  
Public Acres: 363

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 1,160

Grazing Administration Info. (AUMs)

Active Preference: 18  
Suspended Nonuse: 0  
Total Preference: 18  
Exchange of Use: 0  
Total: 18

Other Forage Demands (AUMs)

Deer: 0  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 0

Season of Use:

PRMP 6/15 - 8/1  
No Action 6/16 - 9/30

Identified Resources  
Conflicts/Concerns

No forage allocations for deer use in the allotment have been made.

Riparian or aquatic habitat may be in less than good habitat.

Management  
Objectives

Allocate forage to meet deer forage demands.

Maintain and improve riparian or aquatic habitat in good or better habitat condition.

Allotment Name: Grubb Springs  
Allotment Number: 0147  
Public Acres: 3,524

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 34,620

Grazing Administration Info. (AUMs)

Active Preference: 130  
Suspended Nonuse: 0  
Total Preference: 130  
Exchange of Use: 454  
Total: 584

Other Forage Demands (AUMs)

Deer: 650  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 650

Season of Use:

PRMP 5/1 - 8/15  
No Action 5/1 - 9/15

Identified Resources  
Conflicts/Concerns

Riparian or aquatic habitat is in less than good habitat condition.

Management  
Objectives

Maintain and improve riparian or aquatic habitat in good or better habitat condition.

Water quality may not currently meet the Department of Environmental Quality water quality standards for beneficial use.

Maintain and improve water quality on public lands to meet or exceed standards for beneficial uses, as specifically established by the Department of Environmental Quality, where BLM authorized actions are having a negative effect on water quality.

Potential for grazing/recreation conflicts with the allotment.

Grazing management should consider recreation concerns.

---

### Constraints

Multiple use management of the allotment has been and will continue to be directed and adjusted via the Spencer Creek Coordinated Resource Management Planning process currently in place.

The grazing lease for BLM lands (and the exchange of use listed) is dependent on and tied to the intermingled private land grazing lease (Weyerhaeuser Company).

---

Allotment Name:	Adams
Allotment Number:	0800
Public Acres:	40

Management Category:	C
Livestock Kind:	Cattle
Other Acres:	0

---

### Grazing Administration Info. (AUMs)

### Other Forage Demands (AUMs)

Active Preference:	6
Suspended Nonuse:	0
Total Preference:	6
Exchange of Use:	0
Total	6

Deer:	0
Elk:	0
Antelope:	0
Horses:	0
Total:	0

---

### Season of Use:

PRMP	5/15 - 10/31
No Action	5/15 - 10/31

---

### Identified Resources Conflicts/Concerns

### Management Objectives

None

---

---

Appendix L - Grazing Management

Allotment Name: Haught  
Allotment Number: 0801  
Public Acres: 400

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

Grazing Administration Info. (AUMs)

Active Preference: 27  
Suspended Nonuse: 0  
Total Preference: 27  
Exchange of Use: 0  
Total: 27

Other Forage Demands (AUMs)

Deer: 7  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 7

Season of Use:

PRMP 5/1 - 6/15  
No Action 5/1 - 7/31

Identified Resources

Conflicts/Concerns

Critical deer winter range occurs in allotment.

Management

Objectives

Management systems should reflect the importance of deer winter range.

Allotment Name: Stock Drive  
Allotment Number: 0802  
Public Acres: 40

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

Grazing Administration Info. (AUMs)

Active Preference: 2  
Suspended Nonuse: 0  
Total Preference: 2  
Exchange of Use: 0  
Total: 2

Other Forage Demands (AUMs)

Deer: 0  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 0

Season of Use:

PRMP 5/1 - 5/31  
No Action 5/1 - 6/30

Identified Resources

Conflicts/Concerns

None

Management

Objectives

Allotment Name: "J" Spring  
Allotment Number: 0803  
Public Acres: 320

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 260

---

Grazing Administration Info. (AUMs)

Active Preference: 7  
Suspended Nonuse: 0  
Total Preference: 7  
Exchange of Use: 0  
Total 7

Other Forage Demands (AUMs)

Deer: 6  
Elk: 0  
Antelope: 2  
Horses: 0  
Total: 8

---

Season of Use:

PRMP 5/1 - 6/30  
No Action 5/1 - 6/23

---

Identified Resources  
Conflicts/Concerns

None

Management  
Objectives

---

---

Allotment Name: Bar CL  
Allotment Number: 0804  
Public Acres: 480

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

---

Grazing Administration Info. (AUMs)

Active Preference: 20  
Suspended Nonuse: 22  
Total Preference: 42  
Exchange of Use: 0  
Total 42

Other Forage Demands (AUMs)

Deer: 10  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 10

---

Season of Use:

PRMP 5/1 - 5/31  
No Action 5/1 - 5/31

---

Identified Resources  
Conflicts/Concerns

None

Management  
Objectives

---

---



Appendix L - Grazing Management

Allotment Name: SE 80  
Allotment Number: 0805  
Public Acres: 80

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

Grazing Administration Info. (AUMs)

Active Preference: 8  
Suspended Nonuse: 0  
Total Preference: 8  
Exchange of Use: 0  
Total: 8

Other Forage Demands (AUMs)

Deer: 1  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 1

Season of Use:

PRMP 5/1 - 10/31  
No Action 5/1 - 10/31

Identified Resources

Conflicts/Concerns

None

Management

Objectives

Allotment Name: Two Mile  
Allotment Number: 0806  
Public Acres: 817

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

Grazing Administration Info. (AUMs)

Active Preference: 80  
Suspended Nonuse: 0  
Total Preference: 80  
Exchange of Use: 0  
Total: 80

Other Forage Demands (AUMs)

Deer: 16  
Elk: 16  
Antelope: 0  
Horses: 0  
Total: 32

Season of Use:

PRMP 5/1 - 9/30  
No Action 5/1 - 9/30

Identified Resources

Conflicts/Concerns

None

Management

Objectives

Allotment Name: Barnwell  
Allotment Number: 0807  
Public Acres: 1,708

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

---

**Grazing Administration Info. (AUMs)**

Active Preference: 100  
Suspended Nonuse: 0  
Total Preference: 100  
Exchange of Use: 0  
Total: 100

**Other Forage Demands (AUMs)**

Deer: 80  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 80

---

**Season of Use:**

PRMP 5/1 - 6/15  
No Action 5/1 - 6/15

---

**Identified Resources**

**Conflicts/Concerns**

Important waterfowl habitat exists within allotment.

Critical deer winter range occurs in allotment.

**Management**

**Objectives**

Maintain or improve existing waterfowl habitat.

Management systems should reflect the importance of deer winter range.

---

Allotment Name: Lee  
Allotment Number: 0808  
Public Acres: 40

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

---

**Grazing Administration Info. (AUMs)**

Active Preference: 10  
Suspended Nonuse: 0  
Total Preference: 10  
Exchange of Use: 0  
Total: 10

**Other Forage Demands (AUMs)**

Deer: 0  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 0

---

**Season of Use:**

PRMP 6/1 - 6/30  
No Action 6/1 - 8/15

---

**Identified Resources**

**Conflicts/Concerns**

Important waterfowl habitat exists within allotment.

**Management**

**Objectives**

Maintain or improve existing waterfowl habitat.

---

Appendix L - Grazing Management

Allotment Name: Brown  
Allotment Number: 0809  
Public Acres: 80

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

Grazing Administration Info. (AUMs)

Active Preference: 30  
Suspended Nonuse: 0  
Total Preference: 0  
Exchange of Use: 0  
Total: 30

Other Forage Demands (AUMs)

Deer: 1  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 1

Season of Use:

PRMP 6/1 - 6/30  
No Action 6/1 - 8/30

Identified Resources  
Conflicts/Concerns

Important waterfowl habitat exists within allotment.

Management  
Objectives

Maintain or improve existing waterfowl habitat.

Allotment Name: Brenda  
Allotment Number: 0810  
Public Acres: 1,300

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

Grazing Administration Info. (AUMs)

Active Preference: 124  
Suspended Nonuse: 0  
Total Preference: 124  
Exchange of Use: 0  
Total: 124

Other Forage Demands (AUMs)

Deer: 24  
Elk: 24  
Antelope: 0  
Horses: 0  
Total: 48

Season of Use:

PRMP 5/1 - 6/30  
No Action 5/1 - 9/30

Identified Resources  
Conflicts/Concerns

None

Management  
Objectives

Constraints

The grazing lease for BLM lands in this allotment is dependent on and tied to the intermingled private land grazing lease (Jeld-Wen, Inc.)

Allotment Name: Cheyenne  
Allotment Number: 0811  
Public Acres: 840

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

---

**Grazing Administration Info. (AUMs)**

Active Preference: 51  
Suspended Nonuse: 0  
Total Preference: 51  
Exchange of Use: 0  
Total: 51

**Other Forage Demands (AUMs)**

Deer: 40  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 40

---

**Season of Use:**

PRMP 5/1 - 6/15  
No Action 5/1 - 6/15

---

**Identified Resources**

**Conflicts/Concerns**

Critical deer winter range occurs in allotment.

---

**Management**

**Objectives**

Management systems should reflect the importance of deer winter range.

---

Allotment Name: Stukel-Coffin  
Allotment Number: 0812  
Public Acres: 760

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

---

**Grazing Administration Info. (AUMs)**

Active Preference: 55  
Suspended Nonuse: 0  
Total Preference: 55  
Exchange of Use: 0  
Total: 55

**Other Forage Demands (AUMs)**

Deer: 14  
Elk: 5  
Antelope: 0  
Horses: 0  
Total: 19

---

**Season of Use:**

PRMP 5/1 - 7/1  
No Action 5/15 - 6/30

---

**Identified Resources**

**Conflicts/Concerns**

None

---

**Management**

**Objectives**

Appendix L - Grazing Management

Allotment Name: Plum Hills  
Allotment Number: 0813  
Public Acres: 160

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

Grazing Administration Info. (AUMs)

Active Preference: 20  
Suspended Nonuse: 0  
Total Preference: 20  
Exchange of Use: 0  
Total: 20

Other Forage Demands (AUMs)

Deer: 4  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 4

Season of Use:

PRMP 5/1 - 6/15  
No Action 4/16 - 6/30

Identified Resources  
Conflicts/Concerns

None

Management  
Objectives

Allotment Name: Cunningham  
Allotment Number: 0814  
Public Acres: 840

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

Grazing Administration Info. (AUMs)

Active Preference: 108  
Suspended Nonuse: 0  
Total Preference: 108  
Exchange of Use: 0  
Total: 108

Other Forage Demands (AUMs)

Deer: 16  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 16

Season of Use:

PRMP 5/1 - 6/15  
No Action 4/26 - 7/15

Identified Resources  
Conflicts/Concerns

Active erosion occurs in the allotment.

Management  
Objectives

Maintain and improve erosion condition to moderate or better condition.

Allotment Name: Stukel-Dehlinger C  
Allotment Number: 0815  
Public Acres: 1,680

Management Category: I  
Livestock Kind: Cattle  
Other Acres: 560

---

**Grazing Administration Info. (AUMs)**

Active Preference: 240  
Suspended Nonuse: 0  
Total Preference: 240  
Exchange of Use: 46  
Total: 286

**Other Forage Demands (AUMs)**

Deer: 31  
Elk: 11  
Antelope: 0  
Horses: 0  
Total: 42

---

**Season of Use:**

PRMP 5/1 - 7/1  
No Action 4/15 - 8/8

---

**Identified Resources**

**Conflicts/Concerns**

Under current management the range condition, level or pattern of utilization, and/or season-of-use may be unacceptable; or carrying capacity may be exceeded.

Critical deer winter range occurs in allotment.

Active erosion occurs in the allotment.

---

**Management**

**Objectives**

Maintain or improve rangeland condition and productivity through a change in grazing management practices, timing, and/or level of active use.

Management systems should reflect the importance of deer winter range.

Maintain and improve erosion condition in moderate or better erosion condition.

---

---



Appendix L - Grazing Management

Allotment Name: Stukel-Dehlinger H  
Allotment Number: 0816  
Public Acres: 440

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

Grazing Administration Info. (AUMs)

Active Preference: 30  
Suspended Nonuse: 0  
Total Preference: 0  
Exchange of Use: 0  
Total: 30

Other Forage Demands (AUMs)

Deer: 8  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 8

Season of Use:

PRMP 5/1 - 7/1  
No Action 5/10 - 8/10

Identified Resources

Conflicts/Concerns

Critical deer winter range occurs in allotment.

Management

Objectives

Management systems should reflect the importance of deer winter range.

Allotment Name: Drew  
Allotment Number: 0817  
Public Acres: 720

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

Grazing Administration Info. (AUMs)

Active Preference: 72  
Suspended Nonuse: 0  
Total Preference: 72  
Exchange of Use: 0  
Total: 72

Other Forage Demands (AUMs)

Deer: 34  
Elk: 14  
Antelope: 0  
Horses: 0  
Total: 48

Season of Use:

PRMP 5/1 - 6/30  
No Action 5/1 - 6/30

Identified Resources

Conflicts/Concerns

None

Management

Objectives

Allotment Name: Bryant-Duncan  
Allotment Number: 0818  
Public Acres: 200

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

---

Grazing Administration Info. (AUMs)

Active Preference: 15  
Suspended Nonuse: 0  
Total Preference: 15  
Exchange of Use: 0  
Total: 15

Other Forage Demands (AUMs)

Deer: 4  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 4

---

Season of Use:

PRMP 5/1 - 6/15  
No Action 5/1 - 5/31

---

Identified Resources  
Conflicts/Concerns

None

---

Management  
Objectives

---

---

Allotment Name: Dupont  
Allotment Number: 0819  
Public Acres: 79

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

---

Grazing Administration Info. (AUMs)

Active Preference: 7  
Suspended Nonuse: 0  
Total Preference: 7  
Exchange of Use: 0  
Total: 7

Other Forage Demand (AUMs)

Deer: 0  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 0

---

Season of Use:

PRMP 5/1 - 6/15  
No Action 4/15 - 6/1

---

Identified Resources  
Conflicts/Concerns

None

---

Management  
Objectives

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---

Appendix L - Grazing Management

Allotment Name: Flesher  
Allotment Number: 0820  
Public Acres: 160

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

Grazing Administration Info. (AUMs)

Active Preference: 16  
Suspended Nonuse: 0  
Total Preference: 16  
Exchange of Use: 0  
Total: 16

Other Forage Demand (AUMs)

Deer: 4  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 4

Season of Use:

PRMP 5/1 - 6/15  
No Action 5/1 - 7/31

Identified Resources

Conflicts/Concerns

None

Management

Objectives

Allotment Name: North Horsefly  
Allotment Number: 0821  
Public Acres: 988

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

Grazing Administration Info. (AUMs)

Active Preference: 68  
Suspended Nonuse: 0  
Total Preference: 68  
Exchange of Use: 0  
Total: 68

Other Forage Demands (AUMs)

Deer: 18  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 18

Season of Use:

PRMP 5/1 - 6/15  
No Action 5/1 - 6/15

Identified Resources

Conflicts/Concerns

None

Management

Objectives

Allotment Name: Jeld-Wen  
Allotment Number: 0822  
Public Acres: 3,122

Management Category: I  
Livestock Kind: Cattle  
Other Acres: 3,160

---

**Grazing Administration Info. (AUMs)**

Active Preference: 210  
Suspended Nonuse: 0  
Total Preference: 210  
Exchange of Use: 0  
Total: 210

**Other Forage Demands (AUMs)**

Deer: 59  
Elk: 20  
Antelope: 0  
Horses: 0  
Total: 79

---

**Season of Use:**

PRMP 5/1 - 7/1  
No Action 5/1 - 7/15

---

**Identified Resources**

**Conflicts/Concerns**

Under current management the range condition, level or pattern of utilization, and/or season-of-use may be unacceptable; or carrying capacity may be exceeded.

Big game limited by unsatisfactory habitat condition.

Critical deer winter range occurs in allotment.

Active erosion occurs in the allotment.

Riparian or aquatic habitat is in less than good habitat condition.

---

**Management**

**Objectives**

Maintain or improve rangeland condition and productivity through a change in grazing management practices, timing, and/or level of active use.

Maintain and improve big game habitat in satisfactory condition.

Management systems should reflect the importance of deer winter range.

Maintain and improve erosion condition in moderate or better erosion condition.

Maintain and improve riparian or aquatic habitat in good or better habitat condition.

---

**Constraints**

The grazing lease for BLM lands within this allotment is dependent on and tied to the intermingled private land grazing lease (Jeld-Wen, Inc.)

The following area is excluded from general livestock grazing: The "Aspen" enclosure.

---

---

Appendix L - Grazing Management

Allotment Name: North Horsefly  
Allotment Number: 0823  
Public Acres: 920

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

Grazing Administration Info. (AUMs)

Active Preference: 60  
Suspended Nonuse: 0  
Total Preference: 60  
Exchange of Use: 0  
Total: 60

Other Forage Demands (AUMs)

Deer: 17  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 17

Season of Use:

PRMP 5/1 - 6/15  
No Action 6/16 - 8/1

Identified Resources  
Conflicts/Concerns

None

Management  
Objectives

Allotment Name: Jeld-Wen  
Allotment Number: 0824  
Public Acres: 360

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

Grazing Administration Info. (AUMs)

Active Preference: 36  
Suspended Nonuse: 0  
Total Preference: 36  
Exchange of Use: 0  
Total: 36

Other Forage Demands (AUMs)

Deer: 7  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 7

Season of Use:

PRMP 6/1 - 7/15  
No Action 6/1 - 10/15

Identified Resources  
Conflicts/Concerns

None

Management  
Objectives

Constraints:

The grazing lease for BLM lands within this allotment is dependent on and tied to the intermingled private land grazing lease (Jeld-Wen, Inc.)

Allotment Name: Naylox  
Allotment Number: 0825  
Public Acres: 760

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

---

Grazing Administration Info. (AUMs)

Active Preference: 76  
Suspended Nonuse: 0  
Total Preference: 76  
Exchange of Use: 0  
Total: 76

Other Forage Demands (AUMs)

Deer: 14  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 14

---

Season of Use:

PRMP 5/1 - 6/30  
No Action 6/1 - 9/30

---

Identified Resources  
Conflicts/Concerns

None

---

Management  
Objectives

---

---

Allotment Name: Haskins  
Allotment Number: 0826  
Public Acres: 560

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

---

Grazing Administration Info. (AUMs)

Active Preference: 80  
Suspended Nonuse: 0  
Total Preference: 80  
Exchange of Use: 0  
Total: 80

Other Forage Demands (AUMs)

Deer: 11  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 11

---

Season of Use:

PRMP 5/1 - 6/15  
No Action 5/1 - 7/15

---

Identified Resources  
Conflicts/Concerns

None

---

Management  
Objectives

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---



Appendix L - Grazing Management

Allotment Name: Stukel-High  
Allotment Number: 0827  
Public Acres: 237

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

Grazing Administration Info. (AUMs)

Active Preference: 17  
Suspended Nonuse: 0  
Total Preference: 17  
Exchange of Use: 0  
Total: 17

Other Forage Demands (AUMs)

Deer: 5  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 5

Season of Use:

PRMP 5/1 - 7/1  
No Action 5/1 - 8/31

Identified Resources

Conflicts/Concerns

Under current management the range condition, level or pattern of utilization, and/or season-of-use may be unacceptable; or carrying capacity may be exceeded.

Big game limited by unsatisfactory habitat condition.

Critical deer winter range occurs in allotment.

Active erosion occurs in the allotment.

Management

Objectives

Maintain or improve rangeland condition and productivity through a change in grazing management practices, timing, and/or level of active use.

Maintain and improve big game habitat in satisfactory condition.

Management systems should reflect the importance of deer winter range.

Maintain and improve erosion condition in moderate or better erosion condition.

Allotment Name: Stukel-Hill  
Allotment Number: 0828  
Public Acres: 960

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

Grazing Administration Info. (AUMs)

Active Preference: 60  
Suspended Nonuse: 0  
Total Preference: 60  
Exchange of Use: 0  
Total: 60

Other Forage Demands (AUMs)

Deer: 18  
Elk: 7  
Antelope: 0  
Horses: 0  
Total: 25

Season of Use:

PRMP 5/1 - 7/1  
No Action 5/1 - 6/15

---

**Identified Resources**  
**Conflicts/Concerns**

Under current management the range condition, level or pattern of utilization, and/or season-of-use may be unacceptable; or carrying capacity may be exceeded.

Big game limited by unsatisfactory habitat condition.

Active erosion occurs in the allotment.

Riparian or aquatic habitat is in less than good habitat condition.

---

**Management**  
**Objectives**

Maintain or improve rangeland condition and productivity through a change in grazing management practices, timing, and/or level of active use.

Maintain and improve big game habitat in satisfactory condition.

Maintain and improve erosion condition in moderate or better erosion condition.

Maintain and improve riparian or aquatic habitat in good or better habitat condition.

---

---

Allotment Name: Horton  
Allotment Number: 0829  
Public Acres: 760

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

---

**Grazing Administration Info. (AUMs)**

Active Preference: 26  
Suspended Nonuse: 0  
Total Preference: 26  
Exchange of Use: 0  
Total: 26

**Other Forage Demands (AUMs)**

Deer: 36  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 36

---

**Season of Use:**

PRMP 5/1 - 6/15  
No Action 4/21 - 6/30

---

---

**Identified Resources**  
**Conflicts/Concerns**

Critical deer winter range occurs in allotment.

---

**Management**  
**Objectives**

Management systems should reflect the importance of deer winter range.

---

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Appendix L - Grazing Management

Allotment Name: Hungry Hollow  
Allotment Number: 0830  
Public Acres: 280

Management Category: C  
Livestock Kind: Horses  
Other Acres: 0

Grazing Administration Info. (AUMs)

Active Preference: 40  
Suspended Nonuse: 0  
Total Preference: 40  
Exchange of Use: 0  
Total: 40

Other Forage Demands (AUMs)

Deer: 5  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 5

Season of Use:

PRMP 5/1 - 6/15  
No Action 6/1 - 8/31

Identified Resources  
Conflicts/Concerns

Management  
Objectives

None

Allotment Name: Warlow  
Allotment Number: 0831  
Public Acres: 460

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

Grazing Administration Info. (AUMs)

Active Preference: 50  
Suspended Nonuse: 0  
Total Preference: 50  
Exchange of Use: 0  
Total: 50

Other Forage Demands (AUMs)

Deer: 8  
Elk: 3  
Antelope: 0  
Horses: 0  
Total: 11

Season of Use:

PRMP 5/1 - 9/30  
No Action 5/1 - 9/30

Identified Resources  
Conflicts/Concerns

Management  
Objectives

Riparian or aquatic habitat is in less than good habitat condition.

Maintain and improve riparian or aquatic habitat in good or better habitat condition.

Allotment Name: Jespersion  
Allotment Number: 0832  
Public Acres: 1,578

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

---

**Grazing Administration Info. (AUMs)**

Active Preference: 158  
Suspended Nonuse: 0  
Total Preference: 158  
Exchange of Use: 0  
Total: 158

**Other Forage Demands (AUMs)**

Deer: 30  
Elk: 30  
Antelope: 0  
Horses: 0  
Total: 60

---

**Season of Use:**

PRMP 5/1 - 7/1  
No Action 5/1 - 7/1

---

**Identified Resources**  
**Conflicts/Concerns**

None

**Management**  
**Objectives**

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---

Allotment Name: Bryant-Johnson  
Allotment Number: 0833  
Public Acres: 40

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

---

**Grazing Administration Info. (AUMs)**

Active Preference: 6  
Suspended Nonuse: 0  
Total Preference: 6  
Exchange of Use: 0  
Total: 6

**Other Forage Demands (AUMs)**

Deer: 0  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 0

---

**Season of Use:**

PRMP 5/1 - 6/30  
No Action 6/1 - 9/30

---

**Identified Resources**  
**Conflicts/Concerns**

None

**Management**  
**Objectives**

---

---

Appendix L - Grazing Management

Allotment Name: Kellison  
Allotment Number: 0834  
Public Acres: 335

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

Grazing Administration Info. (AUMs)

Active Preference: 19  
Suspended Nonuse: 0  
Total Preference: 19  
Exchange of Use: 0  
Total: 19

Other Forage Demands (AUMs)

Deer: 6  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 6

Season of Use:

PRMP 5/1 - 6/15  
No Action 5/1 - 6/13

Identified Resources

Conflicts/Concerns

None

Management

Objectives

Allotment Name: Kethcham  
Allotment Number: 0835  
Public Acres: 320

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

Grazing Administration Info. (AUMs)

Active Preference: 20  
Suspended Nonuse: 0  
Total Preference: 20  
Exchange of Use: 0  
Total: 20

Other Forage Demands (AUMs)

Deer: 16  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 16

Season of Use:

PRMP 5/1 - 6/15  
No Action 5/1 - 7/31

Identified Resources

Conflicts/Concerns

Critical deer winter range occurs in allotment.

Management

Objectives

Management systems should reflect the importance of deer winter range.

Allotment Name: Harpold Chaining  
Allotment Number: 0836  
Public Acres: 900

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

---

**Grazing Administration Info. (AUMs)**

Active Preference: 96  
Suspended Nonuse: 0  
Total Preference: 96  
Exchange of Use: 0  
Total: 96

**Other Forage Demands (AUMs)**

Deer: 101  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 101

---

**Season of Use:**

PRMP 5/1 - 5/31  
No Action 5/1 - 5/31

---

**Identified Resources**  
**Conflicts/Concerns**

Under current management the range condition, level or pattern of utilization, and/or season-of-use may be unacceptable; or carrying capacity may be exceeded.

Critical deer winter range occurs in allotment.

---

**Management**  
**Objectives**

Maintain or improve rangeland condition and productivity through a change in grazing management practices, timing, and/or level of active use.

Management systems should reflect the importance of deer winter range.

---

---

Allotment Name: Bryant-Horton  
Allotment Number: 0837  
Public Acres: 1,249

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

---

**Grazing Administration Info. (AUMs)**

Active Preference: 130  
Suspended Nonuse: 0  
Total Preference: 130  
Exchange of Use: 0  
Total: 130

**Other Forage Demands (AUMs)**

Deer: 24  
Elk: 8  
Antelope: 0  
Horses: 0  
Total: 32

---

**Season of Use:**

PRMP 6/1 - 6/30  
No Action 5/16 - 8/15

---

**Identified Resources**  
**Conflicts/Concerns**

None

---

**Management**  
**Objectives**



Appendix L - Grazing Management

Allotment Name: Windy Ridge  
Allotment Number: 0838  
Public Acres: 600

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

Grazing Administration Info. (AUMs)

Active Preference: 52  
Suspended Nonuse: 0  
Total Preference: 52  
Exchange of Use: 0  
Total: 52

Other Forage Demands (AUMs)

Deer: 11  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 11

Season of Use:

PRMP 5/1 - 6/15  
No Action 5/1 - 6/30

Identified Resources  
Conflicts/Concerns

Under current management the range condition, level or pattern of utilization, and/or season-of-use may be unacceptable; or carrying capacity may be exceeded.

Critical deer winter range occurs in allotment.

Management  
Objectives

Maintain or improve rangeland condition and productivity through a change in grazing management practices, timing, and/or level of active use.

Management systems should reflect the importance of deer winter range.

Allotment Name: Bryant-Loveness  
Allotment Number: 0839  
Public Acres: 3,440

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

Grazing Administration Info. (AUMs)

Active Preference: 490  
Suspended Nonuse: 0  
Total Preference: 490  
Exchange of Use: 0  
Total: 490

Other Forage Demands (AUMs)

Deer: 161  
Elk: 21  
Antelope: 0  
Horses: 0  
Total: 182

Season of Use:

PRMP 5/1 - 6/30  
No Action 4/21 - 7/28

Identified Resources  
Conflicts/Concerns

Under current management the range condition, level or pattern of utilization, and/or season-of-use may be unacceptable; or carrying capacity may be exceeded.

Management  
Objectives

Maintain or improve rangeland condition and productivity through a change in grazing management practices, timing, and/or level of active use.

Allotment Name: Bryant-Lyon  
Allotment Number: 0840  
Public Acres: 565

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

---

**Grazing Administration Info. (AUMs)**

Active Preference: 38  
Suspended Nonuse: 0  
Total Preference: 38  
Exchange of Use: 0  
Total: 38

**Other Forage Demands (AUMs)**

Deer: 11  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 11

---

**Season of Use:**

PRMP 5/1 - 5/31  
No Action 5/1 - 9/30

---

**Identified Resources**  
**Conflicts/Concerns**

None

**Management**  
**Objectives**

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Allotment Name: Marshall  
Allotment Number: 0841  
Public Acres: 348

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

---

**Grazing Administration Info. (AUMs)**

Active Preference: 14  
Suspended Nonuse: 0  
Total Preference: 14  
Exchange of Use: 0  
Total: 14

**Other Forage Demands (AUMs)**

Deer: 17  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 17

---

**Season of Use:**

PRMP 5/1 - 6/15  
No Action 4/21 - 5/31

---

**Identified Resources**  
**Conflicts/Concerns**

Critical deer winter range occurs in allotment.

**Management**  
**Objectives**

Management systems should reflect the importance of deer winter range.

---

---

Appendix L - Grazing Management

Allotment Name: Masten  
Allotment Number: 0842  
Public Acres: 485

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

Grazing Administration Info. (AUMs)

Active Preference: 40  
Suspended Nonuse: 0  
Total Preference: 40  
Exchange of Use: 0  
Total: 40

Other Forage Demands (AUMs)

Deer: 10  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 10

Season of Use:

PRMP 5/1 - 6/15  
No Action 5/1 - 9/15

Identified Resources  
Conflicts/Concerns

Management  
Objectives

None

Allotment Name: Mc Auliffe  
Allotment Number: 0843  
Public Acres: 80

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

Grazing Administration Info. (AUMs)

Active Preference: 10  
Suspended Nonuse: 0  
Total Preference: 10  
Exchange of Use: 0  
Total: 10

Other Forage Demands (AUMs)

Deer: 1  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 1

Season of Use:

PRMP 5/1 - 5/31  
No Action 5/1 - 5/31

Identified Resources  
Conflicts/Concerns

Management  
Objectives

None

Allotment Name: Paddock  
Allotment Number: 0844  
Public Acres: 440

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 240

---

**Grazing Administration Info. (AUMs)**

Active Preference: 31  
Suspended Nonuse: 0  
Total Preference: 31  
Exchange of Use: 0  
Total: 31

**Other Forage Demands (AUMs)**

Deer: 8  
Elk: 0  
Antelope: 3  
Horses: 0  
Total: 11

---

**Season of Use:**

PRMP 5/ - 6/30  
No Action 5/1 - 6/30

---

**Identified Resources**  
**Conflicts/Concerns**

None

**Management**  
**Objectives**

---

---

Allotment Name: K-Hills O'Connor  
Allotment Number: 0845  
Public Acres: 500

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

---

**Grazing Administration Info. (AUMs)**

Active Preference: 55  
Suspended Nonuse: 0  
Total Preference: 55  
Exchange of Use: 0  
Total: 55

**Other Forage Demands (AUMs)**

Deer: 10  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 10

---

**Season of Use:**

PRMP 5/1 - 6/15  
No Action 4/1 - 5/31

---

**Identified Resources**  
**Conflicts/Concerns**

None

**Management**  
**Objectives**

---

---

Appendix L - Grazing Management

Allotment Name: OK  
Allotment Number: 0846  
Public Acres: 1,260

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

Grazing Administration Info. (AUMs)

Active Preference: 105  
Suspended Nonuse: 0  
Total Preference: 105  
Exchange of Use: 0  
Total: 105

Other Forage Demands (AUMs)

Deer: 24  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 24

Season of Use:

PRMP 5/1 - 6/15  
No Action 5/1 - 6/15

Identified Resources  
Conflicts/Concerns

Potential for grazing/recreation conflicts within the allotment.

Management  
Objectives

Grazing management should consider recreation concerns.

Constraints

Allotment recently changed from sheep to cattle use via a grazing decision. The active preference listed above is an initial estimate of grazing capacity for cattle that will be monitored and adjusted if necessary in the future. The prior sheep preference was 140 AUMs.

Allotment Name: Swede Cabin  
Allotment Number: 0847  
Public Acres: 1,921

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

Grazing Administration Info. (AUMs)

Active Preference: 108  
Suspended Nonuse: 0  
Total Preference: 108  
Exchange of Use: 0  
Total: 108

Other Forage Demands (AUMs)

Deer: 36  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 36

Season of Use:

PRMP 5/1 - 6/15  
No Action 5/1 - 6/15

Identified Resources  
Conflicts/Concerns

Special status species and/or habitat exists within the allotment.

Management  
Objectives

Prevent significant risk to well-being of special status species and/or habitat from BLM-authorized actions.

Allotment Name: Pope  
Allotment Number: 0848  
Public Acres: 1,044

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

---

**Grazing Administration Info. (AUMs)**

Active Preference: 70  
Suspended Nonuse: 0  
Total Preference: 70  
Exchange of Use: 0  
Total: 70

**Other Forage Demands (AUMs)**

Deer: 19  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 19

---

**Season of Use:**

PRMP 5/1 - 6/15  
No Action 5/1 - 9/30

---

**Identified Resources**  
**Conflicts/Concerns**

**Management**  
**Objectives**

None

---

---

Allotment Name: Rajnus Bros.  
Allotment Number: 0849  
Public Acres: 480

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

---

**Grazing Administration Info. (AUMs)**

Active Preference: 32  
Suspended Nonuse: 0  
Total Preference: 32  
Exchange of Use: 0  
Total: 32

**Other Forage Demands (AUMs)**

Deer: 10  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 10

---

**Season of Use:**

PRMP 5/1 - 6/15  
No Action 5/1 - 8/31

---

**Identified Resources**  
**Conflicts/Concerns**

**Management**  
**Objectives**

None

---

---



Appendix L - Grazing Management

Allotment Name: Wilkinson  
Allotment Number: 0850  
Public Acres: 320

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

Grazing Administration Info. (AUMs)

Active Preference: 18  
Suspended Nonuse: 0  
Total Preference: 18  
Exchange of Use: 0  
Total: 18

Other Forage Demands (AUMs)

Deer: 6  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 6

Season of Use:

PRMP 5/1 - 6/15  
No Action 5/1 - 6/5

Identified Resources  
Conflicts/Concerns

Critical deer winter range occurs in allotment.

Management  
Objectives

Management systems should reflect the importance of deer winter range.

Allotment Name: Harpold Ridge  
Allotment Number: 0851  
Public Acres: 1,043

Management Category: M  
Livestock Kind: Cattle  
Other Acres: 0

Grazing Administration Info. (AUMs)

Active Preference: 108  
Suspended Nonuse: 0  
Total Preference: 108  
Exchange of Use: 0  
Total: 108

Other Forage Demands (AUMs)

Deer: 49  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 49

Season of Use:

PRMP 5/1 - 5/31  
No Action 4/21 - 6/30

Identified Resources  
Conflicts/Concerns

Critical deer winter range occurs in allotment.

Management  
Objectives

Management systems should reflect the importance of deer winter range.

Allotment Name: Rodgers  
Allotment Number: 0852  
Public Acres: 2,549

Management Category: I  
Livestock Kind: Cattle  
Other Acres: 0

---

**Grazing Administration Info. (AUMs)**

Active Preference: 249  
Suspended Nonuse: 0  
Total Preference: 249  
Exchange of Use: 0  
Total: 249

**Other Forage Demands (AUMs)**

Deer: 48  
Elk: 17  
Antelope: 0  
Horses: 0  
Total: 65

---

**Season of Use:**

PRMP 5/1 - 7/1  
No Action 4/15 - 8/31

---

**Identified Resources**

**Conflicts/Concerns**

Under current management the range condition, level or pattern of utilization, and/or season-of-use may be unacceptable; or carrying capacity may be exceeded.

Big game limited by unsatisfactory habitat condition.

Critical deer winter range occurs in allotment.

Active erosion occurs in the allotment.

Riparian or aquatic habitat is in less than good habitat condition.

---

**Management**

**Objectives**

Maintain or improve rangeland condition and productivity through a change in grazing management practices, timing, and/or level of active use.

Maintain and improve big game habitat in satisfactory condition.

Management systems should reflect the importance of deer winter range.

Maintain and improve erosion condition in moderate or better erosion condition.

Maintain and improve riparian or aquatic habitat in good or better habitat condition.

---

**Constraints**

The following area is excluded from general livestock grazing: Van Meter Flat Reservoir enclosure.

---

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Appendix L - Grazing Management

Allotment Name: 7C  
Allotment Number: 0853  
Public Acres: 688

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

Grazing Administration Info. (AUMs)

Active Preference: 104  
Suspended Nonuse: 0  
Total Preference: 104  
Exchange of Use: 0  
Total: 104

Other Forage Demands (AUMs)

Deer: 13  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 13

Season of Use:

PRMP 5/1 - 6/30  
No Action 5/1 - 6/30

Identified Resources

Conflicts/Concerns

Special status species and/or habitat exists within the allotment.

Management

Objectives

Prevent significant risk to well-being of special status species and/or habitat from BLM-authorized actions.

Allotment Name: Jump  
Allotment Number: 0854  
Public Acres: 200

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

Grazing Administration Info. (AUMs)

Active Preference: 20  
Suspended Nonuse: 0  
Total Preference: 20  
Exchange of Use: 0  
Total: 20

Other Forage Demands (AUMs)

Deer: 4  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 4

Season of Use:

PRMP 5/1 - 5/31  
No Action 5/1 - 5/31

Identified Resources

Conflicts/Concerns

None

Management

Objectives

Allotment Name: Bryant-Smith  
Allotment Number: 0855  
Public Acres: 1,140

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

---

**Grazing Administration Info. (AUMs)**

Active Preference: 109  
Suspended Nonuse: 0  
Total Preference: 109  
Exchange of Use: 0  
Total: 109

**Other Forage Demands (AUMs)**

Deer: 22  
Elk: 7  
Antelope: 0  
Horses: 0  
Total: 29

---

**Season of Use:**

PRMP 5/15 - 6/15  
No Action 5/15 - 8/31

---

**Identified Resources**

**Conflicts/Concerns**

Under current management the range condition, level or pattern of utilization, and/or season-of-use may be unacceptable; or carrying capacity may be exceeded.

Riparian or aquatic habitat is in less than good habitat condition.

Potential for grazing/recreation conflicts within the allotment.

---

**Management**

**Objectives**

Maintain or improve rangeland condition and productivity through a change in grazing management practices, timing, and/or level of active use.

Maintain and improve riparian or aquatic habitat in good or better habitat condition.

Grazing management should consider recreation concerns.

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Appendix L - Grazing Management

Allotment Name: Bryant-Stastny  
Allotment Number: 0856  
Public Acres: 440

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

Grazing Administration Info. (AUMs)

Active Preference: 70  
Suspended Nonuse: 0  
Total Preference: 70  
Exchange of Use: 0  
Total: 70

Other Forage Demands (AUMs)

Deer: 8  
Elk: 3  
Antelope: 0  
Horses: 0  
Total: 11

Season of Use:

PRMP 5/10 - 9/30  
No Action 5/10 - 9/30

Identified Resources  
Conflicts/Concerns

None

Management  
Objectives

Allotment Name: Bryant-Taylor  
Allotment Number: 0857  
Public Acres: 1,080

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

Grazing Administration Info. (AUMs)

Active Preference: 74  
Suspended Nonuse: 0  
Total Preference: 74  
Exchange of Use: 0  
Total: 74

Other Forage Demands (AUMs)

Deer: 14  
Elk: 4  
Antelope: 0  
Horses: 0  
Total: 18

Season of Use:

PRMP 4/15 - 9/30  
No Action 4/15 - 9/30

Identified Resources  
Conflicts/Concerns

Potential for grazing/recreation conflicts within the allotment.

Management  
Objectives

Grazing management should consider recreation concerns.

Allotment Name: Swan Lake Rim  
Allotment Number: 0858  
Public Acres: 6,448

Management Category: M  
Livestock Kind: Cattle  
Other Acres: 0

---

**Grazing Administration Info. (AUMs)**

Active Preference: 300  
Suspended Nonuse: 0  
Total Preference: 300  
Exchange of Use: 0  
Total: 300

**Other Forage Demands (AUMs)**

Deer: 121  
Elk: 116  
Antelope: 0  
Horses: 0  
Total: 237

---

**Season of Use:**

PRMP 5/1 - 6/30  
No Action 5/1 - 6/30

---

**Identified Resources**

**Conflicts/Concerns**

Under current management the range condition, level or pattern of utilization, and/or season-of-use may be unacceptable; or carrying capacity may be exceeded.

Critical deer winter range occurs in allotment.

Potential for grazing/recreation conflicts within the allotment.

---

**Management**

**Objectives**

Maintain or improve rangeland condition and productivity through a change in grazing management practices, timing, and/or level of active use.

Management systems should reflect the importance of deer winter range.

Grazing management should consider recreation concerns.

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Appendix L - Grazing Management

Allotment Name: Cunard  
Allotment Number: 0859  
Public Acres: 370

Management Category: I  
Livestock Kind: Horses  
Other Acres: 0

Grazing Administration Info. (AUMs)

Active Preference: 60  
Suspended Nonuse: 0  
Total Preference: 60  
Exchange of Use: 0  
Total: 60

Other Forage Demands (AUMs)

Deer: 7  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 7

Season of Use:

PRMP 5/15 - 7/1  
No Action 5/1 - 7/31

Identified Resources

Conflicts/Concerns

Under current management the range condition, level or pattern of utilization, and/or season-of-use may be unacceptable; or carrying capacity may be exceeded.

Big game limited by unsatisfactory habitat condition.

Critical deer winter range occurs in allotment.

Active erosion occurs in the allotment.

Riparian or aquatic habitat is in less than good habitat condition.

Management

Objectives

Maintain or improve rangeland condition and productivity through a change in grazing management practices, timing, and/or level of active use.

Maintain and improve big game habitat in satisfactory condition.

Management systems should reflect the importance of deer winter range.

Maintain and improve erosion condition in moderate or better erosion condition.

Maintain and improve riparian or aquatic habitat in good or better habitat condition.

Allotment Name: McCartie  
Allotment Number: 0860  
Public Acres: 545

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

Grazing Administration Info. (AUMs)

Active Preference: 83  
Suspended Nonuse: 0  
Total Preference: 83  
Exchange of Use: 0  
Total: 83

Other Forage Demands (AUMs)

Deer: 25  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 25

---

**Season of Use:**

PRMP	5/1 - 5/31
No Action	5/1 - 5/31

---

**Identified Resources**  
**Conflicts/Concerns**

Critical deer winter range occurs in allotment.

---

**Management**  
**Objectives**

Management systems should reflect the importance of deer winter range.

---

**Constraints**

Multiple use management of the allotment will be consistent with the Yainax Butte Coordinated Resource Management Planning (CRMP) process currently in place.

---

Allotment Name:	Yainax Butte
Allotment Number:	0861
Public Acres:	2,520

Management Category:	M
Livestock Kind:	Cattle
Other Acres:	0

---

---

**Grazing Administration Info. (AUMs)**

Active Preference:	120
Suspended Nonuse:	0
Total Preference:	120
Exchange of Use:	0
Total:	120

---

**Other Forage Demands (AUMs)**

Deer:	119
Elk:	0
Antelope:	0
Horses:	0
Total:	119

---

---

**Season of Use:**

PRMP	6/1 - 9/15
No Action	7/1 - 9/30

---

**Identified Resources**  
**Conflicts/Concerns**

Critical deer winter range occurs in allotment.

Potential Area of Critical Environmental Concern (ACEC) within this allotment.

---

**Management**  
**Objectives**

Management systems should reflect the importance of deer winter range.

If designated, grazing management will be consistent with the ACEC management plan.

---

**Constraints**

Multiple use management of the allotment will be consistent with the Yainax Butte Coordinated Resource Management Planning (CRMP) process currently in place.

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Appendix L - Grazing Management

Allotment Name: Klamath Forest Estates  
Allotment Number: 0862  
Public Acres: 2,520

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

Grazing Administration Info. (AUMs)

Active Preference: 47  
Suspended Nonuse: 0  
Total Preference: 47  
Exchange of Use: 0  
Total: 47

Other Forage Demands (AUMs)

Deer: 47  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 47

Season of Use:

PRMP 5/1 - 5/31  
No Action 5/1 - 5/31

Identified Resources

Conflicts/Concerns

Critical deer winter range occurs in allotment.

Management

Objectives

Management systems should reflect the importance of deer winter range.

Constraints

Multiple use management of the allotment will be consistent with the Yainax Butte Coordinated Resource Management Planning (CRMP) process currently in place.

Allotment Name: Wirth  
Allotment Number: 0863  
Public Acres: 1,360

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

Grazing Administration Info. (AUMs)

Active Preference: 113  
Suspended Nonuse: 0  
Total Preference: 113  
Exchange of Use: 0  
Total: 113

Other Forage Demands (AUMs)

Deer: 25  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 25

Season of Use:

PRMP 4/15 - 10/15  
No Action 4/15 - 10/15

Identified Resources

Conflicts/Concerns

None

Management

Objectives

Allotment Name: Rajnus & Son  
Allotment Number: 0864  
Public Acres: 1,440

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

---

**Grazing Administration Info. (AUMs)**

Active Preference: 110  
Suspended Nonuse: 0  
Total Preference: 110  
Exchange of Use: 0  
Total: 110

**Other Forage Demands (AUMs)**

Deer: 28  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 28

---

**Season of Use:**

PRMP 5/1 - 6/15  
No Action 5/1 - 6/30

---

**Identified Resources**

**Conflicts/Concerns**

Critical deer winter range occurs in allotment.

**Management**

**Objectives**

Management systems should reflect the importance of deer winter range.

---

Allotment Name: Mills Creek  
Allotment Number: 0865  
Public Acres: 280

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

---

**Grazing Administration Info. (AUMs)**

Active Preference: 40  
Suspended Nonuse: 0  
Total Preference: 40  
Exchange of Use: 0  
Total: 40

**Other Forage Demands (AUMs)**

Deer: 5  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 5

---

**Season of Use:**

PRMP 5/1 - 5/31  
No Action 5/1 - 6/14

---

**Identified Resources**

**Conflicts/Concerns**

None

**Management**

**Objectives**

Appendix L - Grazing Management

Allotment Name: Bear Valley  
Allotment Number: 0876  
Public Acres: 5,018

Management Category: I  
Livestock Kind: Cattle  
Other Acres: 4,780

Grazing Administration Info. (AUMs)

Active Preference: 475  
Suspended Nonuse: 0  
Total Preference: 475  
Exchange of Use: 0  
Total: 475

Other Forage Demands (AUMs)

Deer: 94  
Elk: 0  
Antelope: 34  
Horses: 0  
Total: 128

Season of Use:

PRMP 6/21 - 8/1  
No Action 7/1 - 8/7

Identified Resources

Conflicts/Concerns

Under current management the range condition, level or pattern of utilization, and/or season-of-use may be unacceptable; or carrying capacity may be exceeded.

Active erosion occurs in the allotment.

Riparian or aquatic habitat is in less than good habitat condition.

Water quality may not currently meet the Department of Environmental Quality water quality standards for beneficial use.

Management

Objectives

Maintain or improve rangeland condition and productivity through a change in grazing management practices, timing, and/or level of active use.

Maintain and improve erosion condition in moderate or better erosion condition.

Maintain and improve riparian or aquatic habitat in good or better habitat condition.

Maintain and improve water quality on public lands to meet or exceed standards for beneficial uses, as specifically established by the Department of Environmental Quality, where BLM authorized actions are having a negative effect on water quality.

Allotment Name: Bumpheads  
Allotment Number: 0877  
Public Acres: 9,220

Management Category: I  
Livestock Kind: Cattle  
Other Acres: 220

Grazing Administration info. (AUMs)

Active Preference: 420  
Suspended Nonuse: 265  
Total Preference: 685  
Exchange of Use: 0  
Total: 685

Other Forage Demands (AUMs)

Deer: 173  
Elk: 0  
Antelope: 63  
Horses: 0  
Total: 236

---

**Season of Use:**

PRMP	4/15 - 6/30
No Action	4/21 - 6/30

---

**Identified Resources**  
**Conflicts/Concerns**

Under current management the range condition, level or pattern of utilization, and/or season-of-use may be unacceptable; or carrying capacity may be exceeded.

Critical deer winter range occurs in allotment.

Grazing management system established but not formally documented.

Potential for grazing/recreation conflicts within the allotment.

---

**Management**  
**Objectives**

Maintain or improve rangeland condition and productivity through a change in grazing management practices, timing, and/or level of active use.

Management systems should reflect the importance of deer winter range.

Revise existing allotment management plan.

Grazing management should consider recreation concerns.

---

Allotment Name:	Campbell
Allotment Number:	0878
Public Acres:	1,465

Management Category:	C
Livestock Kind:	Horses
Other Acres:	3,140

---

---

**Grazing Administration Info. (AUMs)**

Active Preference:	47
Suspended Nonuse:	12
Total Preference:	59
Exchange of Use:	173
Total:	232

---

**Other Forage Demands (AUMs)**

Deer:	28
Elk:	0
Antelope:	10
Horses:	0
Total:	38

---

---

**Season of Use:**

PRMP	5/1 - 6/15
No Action	5/1 - 10/26

---

**Identified Resources**  
**Conflicts/Concerns**

Riparian or aquatic habitat is in less than good habitat condition.

---

**Management**  
**Objectives**

Maintain and improve riparian or aquatic habitat in good or better habitat condition.

---



Appendix L - Grazing Management

Allotment Name: Devaul  
Allotment Number: 0879  
Public Acres: 240

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 320

Grazing Administration Info. (AUMs)

Active Preference: 12  
Suspended Nonuse: 15  
Total Preference: 27  
Exchange of Use: 0  
Total: 27

Other Forage Demands (AUMs)

Deer: 5  
Elk: 0  
Antelope: 2  
Horses: 0  
Total: 7

Season of Use:

PRMP 5/1 - 8/1  
No Action 5/1 - 8/31

Identified Resources  
Conflicts/Concerns

Riparian or aquatic habitat is in less than good habitat condition.

Management  
Objectives

Maintain and improve riparian or aquatic habitat in good or better habitat condition.

Allotment Name: Goodlow  
Allotment Number: 0881  
Public Acres: 285

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 640

Grazing Administration Info. (AUMs)

Active Preference: 32  
Suspended Nonuse: 52  
Total Preference: 84  
Exchange of Use: 0  
Total: 84

Other Forage Demands (AUMs)

Deer: 6  
Elk: 0  
Antelope: 2  
Horses: 0  
Total: 8

Season of Use:

PRMP 5/1 - 8/31  
No Action 5/1 - 8/31

Identified Resources  
Conflicts/Concerns

None

Management  
Objectives

Allotment Name: Horsefly  
Allotment Number: 0882  
Public Acres: 26,356

Management Category: I  
Livestock Kind: Cattle  
Other Acres: 4,779

---

**Grazing Administration Info. (AUMs)**

Active Preference: 2,656  
Suspended Nonuse: 2,075  
Total Preference: 4,731  
Exchange of Use: 70  
Total: 4,801

**Other Forage Demands (AUMs)**

Deer: 495  
Elk: 30  
Antelope: 181  
Horses: 0  
Total: 706

---

**Season of Use:**

PRMP 4/15 - 6/30, 10/1 - 10/30  
No Action 4/21 - 6/30, 10/1 - 10/30

---

**Identified Resources**

**Conflicts/Concerns**

Under current management the range condition, level or pattern of utilization, and/or season-of-use may be unacceptable; or carrying capacity may be exceeded.

No forage allocations for elk use in the allotment have been made.

Critical deer winter range occurs in allotment.

Special status species and/or habitat exists within the allotment.

Wetlands habitat in less than satisfactory condition.

Riparian or aquatic habitat is in less than good habitat condition.

Water quality may not currently meet the Department of Environmental Quality water quality standards for beneficial use.

Grazing management system established but not formally documented.

Potential for grazing/recreation conflicts within the allotment.

---

**Management**

**Objectives**

Maintain or improve rangeland condition and productivity through a change in grazing management practices, timing, and/or level of active use.

Allocate forage to meet elk forage demands.

Management systems should reflect the importance of deer winter range.

Prevent significant risk to well-being of special status species and/or habitat from BLM-authorized actions. Grazing use and management will be consistent with the biological opinion for the allotment.

Improve wetlands habitat condition to satisfactory or better.

Maintain and improve riparian or aquatic habitat in good or better habitat condition.

Maintain and improve water quality on public lands to meet or exceed standards for beneficial uses, as specifically established by the Department of Environmental Quality, where BLM authorized actions are having a negative effect on water quality.

Revise existing allotment management plan.

Grazing management should consider recreation concerns.

**Constraints**

The following areas are excluded from general livestock grazing: The two Longbranch Creek enclosures (Norcross Pasture).

In the fall (10/1 - 10/30), after summer use on USFS lands, cattle are trailed through the allotment with short term stop overs in the Waterspreader pasture. Maximum use during this period is 204 AUMs.

Allotment Name:	Horton	Management Category:	C
Allotment Number:	0883	Livestock Kind:	Cattle
Public Acres:	880	Other Acres:	342

**Grazing Administration Info. (AUMs)**

Active Preference:	58
Suspended Nonuse:	211
Total Preference:	269
Exchange of Use:	15
Total:	284

**Other Forage Demands (AUMs)**

Deer:	41
Elk:	0
Antelope:	6
Horses:	0
Total:	47

**Season of Use:**

PRMP	5/1 - 6/15
No Action	4/21 - 5/20

**Identified Resources  
Conflicts/Concerns**

Under current management the range condition, level or pattern of utilization, and/or season-of-use may be unacceptable; or carrying capacity may be exceeded.

Critical deer winter range occurs in allotment.

Potential for grazing/recreation conflicts within the allotment.

**Management  
Objectives**

Maintain or improve rangeland condition and productivity through a change in grazing management practices, timing, and/or level of active use.

Management systems should reflect the importance of deer winter range.

Grazing management should consider recreation concerns.

Allotment Name: Pankey Basin  
Allotment Number: 0884  
Public Acres: 282

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 508

---

**Grazing Administration Info. (AUMs)**

Active Preference: 43  
Suspended Nonuse: 39  
Total Preference: 82  
Exchange of Use: 95  
Total: 177

**Other Forage Demands (AUMs)**

Deer: 5  
Elk: 0  
Antelope: 2  
Horses: 0  
Total: 7

---

**Season of Use:**

PRMP 5/1 - 8/1  
No Action 5/15 - 8/31

---

**Identified Resources**

**Conflicts/Concerns**

Riparian or aquatic habitat is in less than good habitat condition.

Water quality may not currently meet the Department of Environmental Quality water quality standards for beneficial use.

**Management**

**Objectives**

Maintain and improve riparian or aquatic habitat in good or better habitat condition.

Maintain and improve water quality on public lands to meet or exceed standards for beneficial uses, as specifically established by the Department of Environmental Quality, where BLM authorized actions are having a negative effect on water quality.

---

---

Appendix L - Grazing Management

Allotment Name: Dry Prairie  
Allotment Number: 0885  
Public Acres: 7,231

Management Category: I  
Livestock Kind: Cattle  
Other Acres: 3,624

---

Grazing Administration Info. (AUMs)

Active Preference: 608  
Suspended Nonuse: 392  
Total Preference: 1,000  
Exchange of Use: 275  
Total: 1,275

Other Forage Demands (AUMs)

Deer: 149  
Elk: 0  
Antelope: 55  
Horses: 0  
Total: 204

---

Season of Use:

PRMP 4/15 - 8/31  
No Action 5/1 - 8/31

---

Identified Resources

Conflicts/Concerns

Under current management the range condition, level or pattern of utilization, and/or season-of-use may be unacceptable; or carrying capacity may be exceeded.

No forage allocations for elk use in the allotment have been made.

Special status species and/or habitat exists within the allotment.

Wetlands habitat in less than satisfactory condition.

Riparian or aquatic habitat is in less than good habitat condition.

Water quality may not currently meet the Department of Environmental Quality water quality standards for beneficial use.

Grazing management system established but not formally documented.

Potential for grazing/recreation conflicts within the allotment.

---

Management

Objectives

Maintain or improve rangeland condition and productivity through a change in grazing management practices, timing, and/or level of active use.

Allocate forage to meet elk forage demands.

Prevent significant risk to well-being of special status species and/or habitat from BLM-authorized actions. Grazing use and management will be consistent with the biological opinion for the allotment.

Improve wetlands habitat condition to satisfactory or better.

Maintain and improve riparian or aquatic habitat in good or better habitat condition.

Maintain and improve water quality on public lands to meet or exceed standards for beneficial uses, as specifically established by the Department of Environmental Quality, where BLM authorized actions are having a negative effect on water quality.

Revise existing allotment management plan.

Grazing management should consider recreation concerns.

---

---

Allotment Name: Horse Camp Rim  
Allotment Number: 0886  
Public Acres: 9,180

Management Category: I  
Livestock Kind: Cattle  
Other Acres: 40

---

**Grazing Administration Info. (AUMs)**

Active Preference: 445  
Suspended Nonuse: 0  
Total Preference: 445  
Exchange of Use: 0  
Total: 445

**Other Forage Demands (AUMs)**

Deer: 172  
Elk: 0  
Antelope: 63  
Horses: 0  
Total: 235

---

**Season of Use:**

PRMP 5/1 - 7/31  
No Action 5/1 - 7/31

---

**Identified Resources**

**Conflicts/Concerns**

No forage allocations for elk use in the allotment have been made.

Riparian or aquatic habitat is in less than good habitat condition.

Water quality may not currently meet the Department of Environmental Quality water quality standards for beneficial use.

Grazing management system established but not formally documented.

---

**Management**

**Objectives**

Allocate forage to meet elk forage demands.

Maintain and improve riparian or aquatic habitat in good or better habitat condition.

Maintain and improve water quality on public lands to meet or exceed standards for beneficial uses, as specifically established by the Department of Environmental Quality, where BLM authorized actions are having a negative effect on water quality.

Revise existing allotment management plan.

---

**Constraints**

The following area is excluded from general livestock grazing: 21 Reservoir enclosure.

---

---



## Appendix L - Grazing Management

Allotment Name:	Pitchlog	Management Category:	I
Allotment Number:	0887	Livestock Kind:	Cattle
Public Acres:	9,280	Other Acres:	1,040

---

### Grazing Administration Info. (AUMs)

Active Preference:	434
Suspended Nonuse:	796
Total Preference:	1,230
Exchange of Use:	80
Total:	1,310

### Other Forage Demands (AUMs)

Deer:	174
Elk:	37
Antelope:	64
Horses:	0
Total:	275

---

### Season of Use:

PRMP	5/1 - 6/30
No Action	5/10 - 6/30

---

### Identified Resources

#### Conflicts/Concerns

Under current management the range condition, level or pattern of utilization, and/or season-of-use may be unacceptable; or carrying capacity may be exceeded.

No forage allocations for elk use in the allotment have been made.

Special status species and/or habitat exists within the allotment.

Wetlands habitat in less than satisfactory condition.

Riparian or aquatic habitat is in less than good habitat condition.

Water quality may not currently meet the Department of Environmental Quality water quality standards for beneficial use.

Grazing management system established but not formally documented.

### Management

#### Objectives

Maintain or improve rangeland condition and productivity through a change in grazing management practices, timing, and/or level of active use.

Allocate forage to meet elk forage demands.

Prevent significant risk to well-being of special status species and/or habitat from BLM authorized actions. Grazing use and management will be consistent with the biological opinion for the allotment.

Improve wetlands habitat condition to satisfactory or better.

Maintain and improve riparian or aquatic habitat in good or better habitat condition.

Maintain and improve water quality on public lands to meet or exceed standards for beneficial uses, as specifically established by the Department of Environmental Quality, where BLM authorized actions are having a negative effect on water quality.

Revise existing allotment management plan.

---

### Constraints

The following area is excluded from general livestock grazing: The Pitchlog Creek enclosure.

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Allotment Name: Rock Creek  
Allotment Number: 0888  
Public Acres: 2,750

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 1,200

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**Grazing Administration Info. (AUMs)**

Active Preference: 216  
Suspended Nonuse: 639  
Total Preference: 855  
Exchange of Use: 227  
Total: 1,082

**Other Forage Demands (AUMs)**

Deer: 130  
Elk: 0  
Antelope: 19  
Horses: 0  
Total: 149

---

**Season of Use:**

PRMP 5/1 - 6/20  
No Action 5/1 - 6/20

---

**Identified Resources**

**Conflicts/Concerns**

No forage allocations for elk use in the allotment have been made.

Riparian or aquatic habitat is in less than good habitat condition.

Water quality may not currently meet the Department of Environmental Quality water quality standards for beneficial use.

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**Management**

**Objectives**

Allocate forage to meet elk forage demands.

Maintain and improve riparian or aquatic habitat in good or better habitat condition.

Maintain and improve water quality on public lands to meet or exceed standards for beneficial uses, as specifically established by the Department of Environmental Quality, where BLM authorized actions are having a negative effect on water quality.

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**Constraints**

Grazing use and management of the allotment will be consistent with the Warm Springs Coordinated Resource Management Planning process currently in place.

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Appendix L - Grazing Management

Allotment Name: Timber Hill  
Allotment Number: 0889  
Public Acres: 2,937

Management Category: I  
Livestock Kind: Cattle  
Other Acres: 760

---

**Grazing Administration Info. (AUMs)**

Active Preference: 270  
Suspended Nonuse: 134  
Total Preference: 404  
Exchange of Use: 34  
Total: 438

**Other Forage Demands (AUMs)**

Deer: 55  
Elk: 0  
Antelope: 20  
Horses: 0  
Total: 75

---

**Season of Use:**

PRMP 6/21 - 7/31  
No Action 6/21 - 7/31

---

**Identified Resources**

**Conflicts/Concerns**

Under current management the range condition, level or pattern of utilization, and/or season-of-use may be unacceptable; or carrying capacity may be exceeded.

No forage allocations for elk use in the allotment have been made.

Riparian or aquatic habitat is in less than good habitat condition.

---

**Management**

**Objectives**

Maintain or improve rangeland condition and productivity through a change in grazing management practices, timing, and/or level of active use.

Allocate forage to meet elk forage demands.

Maintain and improve riparian or aquatic habitat in good or better habitat condition.

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Allotment Name: Willow Valley  
Allotment Number: 0890  
Public Acres: 20,460

Management Category: I  
Livestock Kind: Cattle  
Other Acres: 887

---

**Grazing Administration Info. (AUMs)**

Active Preference: 1,320  
Suspended Nonuse: 444  
Total Preference: 1,764  
Exchange of Use: 175  
Total: 1,939

**Other Forage Demands (AUMs)**

Deer: 960  
Elk: 0  
Antelope: 141  
Horses: 0  
Total: 1,101

---

**Season of Use:**

PRMP 4/15 - 6/30  
No Action 4/21 - 6/20

---

**Identified Resources**

**Conflicts/Concerns**

Under current management the range condition, level or pattern of utilization, and/or season-of-use may be unacceptable; or carrying capacity may be exceeded.

No forage allocations for elk use in the allotment have been made.

Special status species and/or habitat exists within the allotment.

Wetlands habitat in less than satisfactory condition.

Riparian or aquatic habitat is in less than good habitat condition.

Water quality may not currently meet the Department of Environmental Quality water quality standards for beneficial use.

Grazing management system established but not formally documented.

---

**Management**

**Objectives**

Maintain or improve rangeland condition and productivity through a change in grazing management practices, timing, and/or level of active use.

Allocate forage to meet elk forage demands.

Prevent significant risk to well-being of special status species and/or habitat from BLM-authorized actions.

Improve wetlands habitat condition to satisfactory or better condition.

Maintain and improve riparian or aquatic habitat in good or better habitat condition.

Maintain and improve water quality on public lands to meet or exceed standards for beneficial uses, as specifically established by the Department of Environmental Quality, where BLM authorized actions are having a negative effect on water quality.

Revise existing allotment management plan.

---

**Constraints**

The following area is excluded from general livestock grazing: Duncan Spring/Antelope Creek enclosure.

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Appendix L - Grazing Management

Allotment Name: Williams  
Allotment Number: 0892  
Public Acres: 1,790

Management Category: M  
Livestock Kind: Cattle  
Other Acres: 0

Grazing Administration Info. (AUMs)

Active Preference: 75  
Suspended Nonuse: 0  
Total Preference: 75  
Exchange of Use: 0  
Total: 75

Other Forage Demands (AUMs)

Deer: 34  
Elk: 0  
Antelope: 12  
Horses: 0  
Total: 46

Season of Use:

PRMP 5/1 - 6/15  
No Action 5/1 - 5/31

Identified Resources

Conflicts/Concerns

None

Management

Objectives

Constraints

Multiple use management of the allotment will be consistent with the Yainax Butte Coordinated Resource Management Planning (CRMP) process currently in place.

Allotment Name: Fields  
Allotment Number: 0893  
Public Acres: 180

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

Grazing Administration Info. (AUMs)

Active Preference: 6  
Suspended Nonuse: 0  
Total Preference: 6  
Exchange of Use: 0  
Total: 6

Other Forage Demands (AUMs)

Deer: 4  
Elk: 0  
Antelope: 1  
Horses: 0  
Total: 5

Season of Use:

PRMP 4/15 - 5/20  
No Action 4/15 - 5/20

Identified Resources

Conflicts/Concerns

None

Management

Objectives

Allotment Name: Voight  
Allotment Number: 0894  
Public Acres: 112

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

---

**Grazing Administration Info. (AUMs)**

Active Preference: 8  
Suspended Nonuse: 0  
Total Preference: 8  
Exchange of Use: 0  
Total: 8

**Other Forage Demands (AUMs)**

Deer: 2  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 2

---

**Season of Use:**

PRMP 5/1 - 6/14  
No Action 5/1 - 6/14

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**Identified Resources**

**Conflicts/Concerns**

None

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**Management**

**Objectives**

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Allotment Name: Harpold Canyon  
Allotment Number: 0895  
Public Acres: 760

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

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**Grazing Administration Info. (AUMs)**

Active Preference: 76  
Suspended Nonuse: 0  
Total Preference: 76  
Exchange of Use: 0  
Total: 76

**Other Forage Demands (AUMs)**

Deer: 20  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 20

---

**Season of Use:**

PRMP 5/1 - 7/31  
No Action 5/1 - 9/30

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**Identified Resources**

**Conflicts/Concerns**

None

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**Management**

**Objectives**

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Appendix L - Grazing Management

Allotment Name: McFall  
Allotment Number: 0896  
Public Acres: 600

Management Category: C  
Livestock Kind: Cattle  
Other Acres: 0

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Grazing Administration Info. (AUMs)

Active Preference: 60  
Suspended Nonuse: 0  
Total Preference: 60  
Exchange of Use: 0  
Total: 60

Other Forage Demands (AUMs)

Deer: 11  
Elk: 0  
Antelope: 0  
Horses: 0  
Total: 11

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Season of Use:

PRMP 5/1 - 5/31  
No Action 5/1 - 6/30

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Identified Resources

Conflicts/Concerns

None

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Management

Objectives

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# Potential Range Improvements by Allotment

(See notes at the end of table for explanation of details.)

Allotment Name/# (Pasture)	Type of Improvement	Units	Cost(\$)/ Unit	No.	Cost(\$)
Chase Mt.(0101)	Reservoir	each	1,200	3	3,600
Edge Crk.(0102) (Ward)	Reservoir	each	1,200	3	3,600
	Fence	mile	3,000	3	9,000
	Veg. Control	acre	90	500	45,000
(Edge Crk.& North)	Reservoir	each	1,200	1	1,200
Buck Mt. (0103)	Fence	mile	3,000	3	9,000
Buck Lake (0104)	Fence	mile	3,000	3	9,000
	Reservoir	each	1,200	1	1,200
Johnson Prairie (0105)	Fence	mile	3,000	0.5	1,500
Dixie (0107)	Fence	mile	3,000	4	12,000
Chicken Hills (0141)	Reservoirs	each	1,200	5	6,000
Long Lake (0142)	Reservoirs	each	1,200	2	2,400
	Fence	mile	3,000	3	9,000
Grub Springs (0147)	Spring	each	2,300	1	2,300
	Reservoirs	each	1,200	2	2,400
Haught (0801)	Veg. Control	acre	90	100	9,000
"J" Spring (0803)	Spring	each	2,300	1	2,300
	Veg. Control	acre	90	80	7,200
Barnwell (0807)	Reservoir	each	1,200	1	1,200
	Fence	mile	3,000	2	6,000
	Veg. Control	acre	90	80	7,200
Lee (0808)	Fence	mile	3,000	1	3,000
Brown (0809)	Fence	mile	3,000	1	3,000
Brenda (0810)	Veg. Control	acre	90	60	5,400
Cheyne (0811)	Reservoir	each	1,200	1	1,200
Stukel-Dehlinger (0815)	Reservoir	each	1,200	1	1,200
	Veg. Control	acre	90	80	7,200

*Appendix L - Grazing Management*

Allotment Name/# (Pasture)	Type of Improvement	Units	Cost(\$)/ Unit	No.	Cost(\$)
Stukel-Dehlinger (0816)	Veg. Control	acre	90	40	3,600
	Reservoir	each	1,200	1	1,200
Drew (0817)	Reservoir	each	1,200	1	1,200
	Veg. Control	acre	90	100	9,000
	Fence	mile	3,000	2	6,000
Bryant-Duncan (0818)	Reservoir	each	1,200	1	1,200
	Veg. Control	acre	90	100	9,000
Flesher (0820)	Veg. Control	acre	90	80	7,200
North Horsefly (0821)	Reservoirs	each	1,200	2	2,400
Jeld-Wen (0822)	Veg. Control	acre	90	280	25,200
	Reservoirs	each	1,200	2	2,400
North Horsefly (0823)	Reservoir	each	1,200	1	1,200
Jeld-Wen (0824)	Reservoir	each	1,200	1	1,200
	Veg. Control	acre	90	80	7,200
Haskins (0826)	Veg. Control	acre	90	80	7,200
Stukel-High (0827)	Veg. Control	acre	90	80	7,200
	Reservoir	each	1,200	1	1,200
Stukel-Hill (0828)	Reservoir	each	1,200	1	1,200
	Veg. Control	acre	90	80	7,200
Horton (0829)	Reservoir	each	1,200	2	2,400
	Spring	each	2,300	1	2,300
	Veg. Control	acre	90	100	9,000
Jespersion (0832)	Veg. Control	acre	90	100	9,000
Ketcham (0835)	Veg. Control	acre	90	80	7,200
Harpold (0836)	Veg. Control	acre	90	500	45,000
	Reservoir	each	1,200	1	1,200
Windy Ridge (0838)	Reservoir	each	1,200	2	2,400
	Fence	mile	3,000	1	3,000
	Veg. Control	acre	90	80	7,200
Bryant-Loveness (0839)	Veg. Control	acre	90	100	9,000
Bryant-Lyon (0840)	Veg. Control	acre	90	40	3,600
Marshall (0841)	Veg. Control	acre	90	80	7,200
Masten (0842)	Veg. Control	acre	90	40	3,600

Allotment Name/# (Pasture)	Type of Improvement	Units	Cost(\$)/ Unit	No.	Cost(\$)
Paddock (0844)	Fence	mile	3,000	2	6,000
	Reservoir	each	1,200	1	1,200
OK (0846)	Reservoir	each	1,200	4	4,800
	Fence	mile	3,000	5	15,000
	Veg. Control	acre	90	200	18,000
Pope (0848)	Veg. Control	acre	90	180	16,200
	Reservoir	each	1,200	1	1,200
Rajnus Bros. (0849)	Veg. Control	acre	90	80	7,200
Wilkinson (0850)	Reservoir	each	1,200	1	1,200
	Spring	each	2,300	1	2,300
	Fence	mile	3,000	2	6,000
	Veg. Control	acre	90	100	9,000
Harpold Ridge (0851)	Reservoir	each	1,200	2	2,400
	Spring	each	2,300	1	2,300
	Veg. Control	acre	90	100	9,000
Rodgers (0852)	Reservoir	each	1,200	2	2,400
	Fence	mile	3,000	3	9,000
	Veg. Control	acre	90	350	31,500
Jump (0854)	Veg. Control	acre	90	80	7,200
Bryant-Stastny (0856)	Reservoir	each	1,200	1	1,200
Venable & Biaggi (0858)	Spring	each	2,300	1	2,300
	Veg. Control	acre	90	200	18,000
Cunard (0859)	Spring	each	2,300	2	4,600
	Veg. Control	acre	90	80	7,200
Wirth (0863)	Reservoir	each	1,200	1	1,200
Rajnus & Son (0864)	Reservoir	each	1,200	1	1,200
	Veg. Control	acre	90	200	18,000
Mills Creek (0865)	Reservoir	each	1,200	1	1,200
	Fence	mile	3,000	1	3,000
Bear Valley (0876)	Reservoir	each	1,200	1	1,200
	Fence	mile	3,000	2	6,000
	Veg. Control	acre	90	500	45,000
	Springs	each	2,300	2	4,600
Bumpheads (0877)	Fence	mile	3,000	2	6,000
	Veg. Control	acre	90	500	45,000
Devaul (0879)	Fence	mile	3,000	1	3,000

# Appendix L - Grazing Management

Allotment Name/# (Pasture)	Type of Improvement	Units	Cost(\$)/ Unit	No.	Cost(\$)
Goodlow (0881)	Reservoir Fence	each	1,200	1	1,200
		mile	3,000	1	3,000
Horsefly (0882)	Reservoir Fence Veg. Control	each	1,200	2	2,400
		mile	3,000	4	12,000
		acre	90	3000	270,000
Horton (0883)	Reservoir Veg. Control	each	1,200	1	1,200
		acre	90	100	9,000
Panky Basin (0884)	Reservoir Fence	each	1,200	2	2,400
		mile	3,000	1	3,000
Dry Prairie (0885)	Reservoir Spring Fence Veg. Control	each	1,200	3	3,600
		each	2,300	1	2,300
		mile	3,000	4	12,000
		acre	90	400	36,000
Horse Camp Rim (0886)	Fence Veg. Control	mile	3,000	1	3,000
		acre	90	1000	90,000
Pitchlog (0887)	Fence Veg. Control Reservoirs	mile	3,000	2	6,000
		acre	90	1000	90,000
		each	1,200	2	2,400
Rock Creek (0888)	Veg. Control	acre	90	200	18,000
Timber Hill (0889)	Reservoir Spring Veg. Control	each	1,200	2	2,400
		each	2,300	1	2,300
		acre	90	100	9,000
Willow Valley (0890)	Reservoir Spring Fence Veg. Control	each	1,200	2	2,400
		each	2,300	2	4,600
		mile	3,000	4	12,000
		acre	90	1500	135,000
Voight (0894)	Veg. Control	acre	90	40	3,600
Harpold Canyon (0895)	Veg. Control	acre	90	100	9,000
McFall (0896)	Reservoir	each	1,200	1	1,200

## Notes on Range Improvements Table:

- ♦ All range improvements listed are for the benefit of multiple resource management and will provide for the rehabilitation, protection and improvement of public rangeland ecosystems. The projects listed in this table may be funded from a variety of sources besides the traditional "range betterment" funds (authorized and allocated by Congress through section 401(b) of the Federal Land Policy and Management Act) including wildlife, fire, riparian, and others. It is expected that during the life of the plan not all of the listed projects will be completed and that some not listed will be implemented. Such changes will be due to future funding constraints or directions, priorities, policies, laws, activity planning, the outcome of Allotment Monitoring Evaluations, and other unknowns. The public will be informed of such changes through the Rangeland Program Summary update found in the Annual Program Summary. (Note: This list of

projects is for new improvements; maintenance and/or reconstructions of existing projects, as needed, is already covered by current Bureau policy.)

- ◆ The majority of the Vegetation Control ("Veg. Control") acres listed in the table are for juniper management/reduction via cutting, although other vegetative conversion techniques, such as fire, may be used when consistent with Bureau policy and procedures. Vegetation manipulation of other vegetative types (such as big sagebrush or wedgeleaf ceanothus) may also be done as part of some allotments vegetation control activities.
- ◆ Unit costs of the listed range improvements are based on 1991-92 average costs for the Resource Area and are the same figures as listed in the Draft Resource Management Plan/Environmental Impact Statement. The actual costs of a given project could be more or less depending on specifics of design, complexity and difficulty of completion, changes in materials and labor costs, and other factors.

## Selective Management

The goals and objectives derived through the planning process are prioritized and incorporated into the range land management program through the selective management process. The purpose of selective management is to prioritize allotments so as to direct management efforts and funding to the areas or allotments with the greatest needs and/or opportunities. The "I" category allotments receive the most management attention, followed by "M" allotments, with "C" allotments receiving the least attention, relatively.

An interdisciplinary team of resource specialists from the Klamath Falls Resource Area reviewed all allotments within the resource area during the draft Resource Management Plan/Environmental Impact Statement process for changes in categorization. The original categorization of allotments was done in the early 1980s and revision was needed to reflect changes in allotment status since that time. The parameters used in this process are listed below, by the three categories, and are consistent with the Bureau's categorization criteria outlined in the 1982 Rangeland Improvement Policy. (The criteria are not listed in a priority order, although on any given allotment some criteria may have more weight than others.) See the allotment specific tables in the section entitled Allotment Management Summaries for the designated selective management category for each allotment.

## Criteria of M, I, C Categories

### "M" Or Maintain

- ◆ Present range condition is satisfactory.
- ◆ Allotments have moderate or high resource production potential and are producing near their potential (or trend is moving in that direction).
- ◆ No serious resource-use conflicts/controversy exist.
- ◆ Opportunities may exist for positive economic return from public investments.
- ◆ Present management appears satisfactory.

### "I" Or Improve

- ◆ Present range condition is unsatisfactory.
- ◆ Allotments have moderate to high resource production potential and are producing at relatively low to moderate levels (trend is typically static to downward).
- ◆ Serious resource use conflicts/controversy exists.
- ◆ Opportunities exist for positive economic return from public investments.
- ◆ Present management appears unsatisfactory.



### "C" Or Custodial

- ◆ Present range condition is not a factor.
- ◆ Allotments have low resource production potential and are producing near their potential (trend is typically static).
- ◆ Limited resource use conflicts/controversy may exist.
- ◆ Opportunities for positive economic return on public investment do not exist or are constrained by technological or economic factors.
- ◆ Present management appears satisfactory or is the only logical practice under existing resource conditions.

Note that an allotment does not have to meet all the criteria points in order to be designated as a particular category and managed by category objectives. It is more of a "best fit" concept versus an "exact fit". For example, most of the allotments in the Gerber Block continue to be designated as "I" category even though significant improvements in riparian and upland vegetative conditions have occurred in many areas. These allotments remain as "I" because of the intensity of public interest in the Gerber Riparian Demonstration Area, the need to continue focusing efforts on management implemented to date, continued opportunities to derive positive returns from expenditures of public funds, and other allotment specific reasons. (Also note that allotment categorization is a relative comparison of allotments within a planning area (that is, the Klamath Falls Resource Area) and allows no accurate comparison with other areas.)

## Range Land Monitoring and Evaluation

### Purpose of Monitoring

- ◆ To determine the effects of management actions on the range land resources.
- ◆ To determine the effectiveness of on-the-ground management actions in achieving resource management objectives within planned time frames.
- ◆ To provide quantifiable data to identify and support needed management actions.
- ◆ To provide quantifiable data for the periodic review of management objectives.

### Monitoring Methods

Monitoring methods must be suitable for the vegetation types and resource conditions that will be encountered. The capability of the methods to detect subtle changes due to management over short periods of time must be carefully considered.

For monitoring data to be meaningful over time, there must be consistency in the kinds of data that are collected and the manner in which they are collected. However, the need for changes in sampling may occasionally arise when problems are detected during a cursory review of the collected data, when analyzing and interpreting the data, or when conducting an evaluation. Serious consideration must be given to the effect changes will have on the historical value of existing data.

The methods briefly discussed here are the methods currently in use and/or planned for future use within the Klamath Falls Resource Area. These methods are consistent with Klamath Falls Resource Area "Coordinated Monitoring and Evaluation Plan for Grazing Allotments", State monitoring guidance, and Bureau Policy. For further information and specifics the following Bureau guidance will be used: the Oregon Rangeland Monitoring Handbook, H-1734-2 (1988); the Rangeland Monitoring Technical References, TR 4400 series; the Riparian Area Management Technical References, TR 1737 series; the BLM Manual Handbooks, 4100 and 4400 series (including the National Range Handbook); and various BLM Washington Office and State Office level Instruction Memorandums. (Refer to the resource area monitoring and evaluation plan for more specifics on all of the following. This plan is available for review at the Klamath Falls Resource Area office.)

## Actual Use

Actual use monitoring provides information concerning the actual amount of grazing use occurring on an area during a specific time period. It is a record of livestock, wildlife, and/or wild horse use in each pasture of an allotment and represents forage consumed in terms of animal unit months. Livestock actual use is provided by the permittees. Data is verified by field checks and other use supervision.

The report includes livestock numbers, pasture usage, and turnout/gathering dates.

Wild horse actual use, in animal unit months, is determined by multiplying inventoried (census) numbers by the grazing period in a given area. The Pokegama Herd Management Area, within the Klamath Falls Resource Area, is located totally within the Dixie (0107) and Edge Creek (0102) allotments.

Estimates of wildlife actual use will be requested from the Oregon Department of Fish and Wildlife, through the BLM wildlife biologists.

Actual use is collected annually on all "I" and "M" allotments.

## Utilization

Utilization data are collected to provide information concerning the percentage of forage that has been consumed or destroyed on an area during a specific period of time. It can also portray the grazing patterns on a pasture or allotment. Utilization data are important in evaluating the effects of grazing use on specific areas and identifying areas of concentrated use that may be dispersed by some form of range improvement.

In the short term, utilization data are considered with actual use and climatic data to determine resource use levels and to identify the need for range improvement projects, adjustment in management actions, and/or adjustments in grazing use levels. These data can be used as the basis for implementing adjustments in grazing use through agreement or by decision.

In the long term, utilization data are considered along with actual use, authorized use, trend, climate, and any other data available or necessary for allotment evaluation. Evaluations are conducted to determine if the grazing management actions and/or practices are achieving the long term management objectives identified in the land-use and activity plans.

The primary methods used in the Klamath Falls Resource Area are the Key Forage Plant method, the Modified Cole Browse method, and Utilization Pattern Mapping. The Key Forage Plant method is an ocular estimate method of judging utilization within one of six utilization classes on one or more key herbaceous and/or browse species, usually at established key areas within an allotment. (Key species are forage species that indicate the degree of use of associated species, or they are species which must, because of their importance, be considered in the management program. Key areas are indicator areas that have the capability to reflect the effectiveness of management on the resources of a larger area within an allotment/pasture.) The Modified Cole Browse method measures utilization of key wildlife browse plant species by all users. Utilization (or Use) Pattern Mapping records use made, within the six utilization classes used in the Key Forage Plant method, by all grazing animals. Key Forage Plant method write-ups may be utilized during Use Pattern Mapping to document the precise utilization taking place at selected locations during the mapping process.

Utilization is usually expressed as a percentage of available, current years production, forage weight that has been consumed or destroyed. The standard time for use mapping and utilization measurement should be at the end of the growing season or the end of the grazing season, whichever occurs later. Exceptions to this will occur as noted in the earlier referenced Technical References. One likely exception may be the reading of utilization prior to cattle use when it is desirable to differentiate (where possible) the use by cattle from that of wildlife or wild horses.

## *Appendix L - Grazing Management*

Utilization studies are read every one to two years on "I" allotments, every three to five years on "M" allotments, and as needed on "C" allotments.

### **Trend**

Trend data are important in determining the effectiveness of on-the-ground management actions and evaluating progress toward meeting management objectives. Trend refers to the direction of change and indicates whether rangeland vegetation is being maintained or is moving toward or away from the desired plant community or other specific vegetation management objectives. Trends of rangelands may be judged by noting changes in composition, density, cover, production, vigor, age class, and frequency of the vegetation, and related parameters of other resources.

The trend techniques used in the Klamath Falls Resource Area are the Nested Frequency and Photo Plot methods. The Nested Frequency method consists of observing the frequency of occurrence (presence/absence) of key plant species within a specific size measurement frame. When frequency transect data indicate a statistically significant change in the frequency of occurrence of the key plant species, the change is evaluated to see if the specific management objectives for the range lands represented by the key area are being met. In addition, both a landscape and a close-up photograph are taken each time a transect is sampled.

The Photo plot method is also used to measure trend includes taking a close-up photograph of the three by three foot plot and a general view photograph of the study site. There are numerous photo plots within the Klamath Falls Resource Area that were established in the 1970's. Continuation of these studies for the purpose of long term photo documentation of changes in the rangelands is extremely important.

Once established, trend studies are read every three to five years on "I" allotments and every ten years on "M" and "C" allotments.

### **Condition**

The Public Rangelands Improvement Act of 1978 definition of "range condition" may be summarized as "the degree to which the present plant community resembles the plant community that best satisfies range management objectives." The Ecological Site Inventory is the Bureau's method of determining condition or ecological status of range land vegetation. The Ecological Site Inventory determines the composition of the existing vegetation by species, within defined homogeneous vegetation types, based on production (weight). Ecological status is use-independent and is defined as the present state of the vegetation and soil protection of an ecological site in relation to the potential natural community for that site. The potential natural community is a final vegetative community that would eventually become established, without interference by man, under present environmental conditions. Ecological status is an expression of the relative degree to which the kinds, proportions, and amounts of plants in the present plant community resemble that of the potential natural community. The Ecological Site Inventory determines the potential of a given range site allowing the eventual development of ecological status or desired plant community objectives. These vegetative objectives would define a plant community to maintain or strive for that would best meet the needs identified by the public. An ecological site inventory is planned for the Klamath Falls Resource Area, tentatively to begin in 1999, after which more specific desired plant community objectives would be developed. Condition will, however, be determined on high priority allotments, at key areas concurrent with trend studies.

Once established, condition monitoring of the Ecological Site Inventory would be done a minimum of once every fifteen years on all category allotments. Condition would, however, be read sooner if trend studies indicated that a statistically significant change in trend was occurring.

### **Climate**

Climate studies provide a comparison of specific grazing season climatic conditions with long-term normals. Crop year (September through June) precipitation accounts for approximately 80 percent of the variation in vegetation production in Great Basin type plant communities. The Forage Yield Index developed at the Squaw Butte

Experiment Station will be used, as appropriate, to adjust forage utilization (F. Sneva and C.M. Britton 1983). Climate data collected at the Klamath Falls National Weather Service Station will be used due to its central location within the resource area.

## Evaluation

The analysis and interpretation of inventory and monitoring data is extremely important in the evaluation of management actions to determine progress in meeting resource management objectives. In addition, an evaluation of monitoring information is necessary to establish or affirm the Appropriate Management Level for the wild horse population in the Pokegama Herd Management Area. The evaluation process must be carefully accomplished to determine if adjustments in grazing use and management actions are needed, and if so, to what extent. Although we believe the grazing use changes proposed in this plan are accurate, reasonable, and supportable, all changes in grazing use on an allotment will be based on the results of an interdisciplinary evaluation of range land monitoring studies, as outlined below. Similarly, the appropriate management level of 30 to 50 wild horses affirmed by this plan is believed to be an accurate appropriate management level, based on professional judgement, for the area encompassed by the Herd Management Area.

The major steps involved in the evaluation process are:

**Assemble and display monitoring and other data.** Review and summarize available data which has been collected from baseline inventories, monitoring studies, supplemental studies and other sources;

**Analyze Data.** Perform all necessary calculations of data; and

**Interpret Data.** After the data has been analyzed, it is interpreted to determine whether the results show a trend or have remained static over time for each type of study. This includes interpreting individual data sets and examining their interrelationships.

In order to assess a proper stocking level or carrying capacity, the following formula may be used (from BLM TR-4400-7):

$$\frac{\text{Actual Use (animal unit months)}}{\text{Adjusted Utilization (percent)}} = \frac{\text{Desired Use (animal unit months)}}{\text{Desired Utilization (percent)}}$$

- ◆ **Actual Use** - Amount of use in animal unit months made by livestock, wild horses, and wildlife
- ◆ **Adjusted Utilization** - Actual utilization level(s) observed via monitoring studies as modified by the yield index
- ◆ **Desired Utilization** - The maximum utilization objective for the area monitored
- ◆ **Desired Use** - The proper stocking level (or population level for wild horses and wildlife), based on the monitoring studies used in the calculations, that would allow meeting of the utilization objective.

**Evaluate Data.** The data is evaluated for consistency, reliability, strong and weak points, completeness and accuracy. If the results of the interpretation indicate a trend, the evaluation attempts to determine the causes of the trends and establish a course of action for future management.

**Review Management Objectives.** Management objectives must be evaluated, as well as the monitoring data, in order to make sure that the objectives are meaningful. In order for management actions to be monitored and progress to be evaluated, the objectives must be measurable and quantifiable as well as simple and understandable. They must also have a probability of attainment within a reasonable time frame. In some cases, detection of a trend toward the desired value may be sufficient to justify continuation of the management practice being evaluated, especially on low response areas where vegetation objectives will be attainable only in the long term. In these cases, intermediate objectives may be useful in evaluating the progress.

**Evaluate Progress In Meeting Management Objectives.** This process determines if management objectives have been met or if adequate progress toward achieving them has occurred or if management objectives or monitoring techniques need redefining.



**Summarize Findings and Make Recommendations.** The formal evaluation concludes with the proposing of concise management recommendations as well as recommendations on changing monitoring techniques, management objectives, key areas, or key species.

By policy, allotment monitoring evaluations are done every five years on "I", every ten years on "M" category allotments, and as needed on "C" allotments.

## General Allowable Use Guidelines

Allowable use is the degree of utilization considered desirable, given our best understanding of proper use, and attainable on various parts of the range or allotment considering the present nature and condition of the resource, management objectives, and level of management. Proper use is a maximum degree of utilization of the current year's growth which, if continued, will maintain or improve the long-term productivity of the site. Proper use varies with the year, season, the ecological site, the physiological requirement of the plant species, associated species, kind of livestock and species of wildlife, past grazing use, and other factors.

The importance of utilization limits has been well established and widely accepted in range research. A minimum level of plant biomass should be present at the end of the growing season to maintain the soil, plant vigor, livestock and wildlife diet quality, and wildlife habitat values. The consequences of continued overutilization are also widely documented. The removal of too much photosynthetic tissue from individual plants results in reduced plant vigor, and if continued, eventual demise of the plants involved. Repeated defoliations of preferred species results in a competitive disadvantage and eventual shifts in plant community composition. Deterioration of the vegetation eventually results in soil loss and reduced site potential.

The degree of allowable use identified for a key plant species for several years serves as a guideline or reference point to evaluate the impacts grazing may be having on the overall welfare of the plant community. In monitoring degrees of utilization, the primary concern is the trend in the community resulting from various levels of use. There are regulatory requirements for the establishment of utilization levels including the following: 43 Code of Federal Regulations 4100.0-8, "The authorized officer shall manage livestock grazing on public lands under the principle of multiple use and sustained yield, and in accordance with applicable land use plans. Land use plans shall establish allowable resource uses... related levels of production or use to be maintained [emphasis added], areas of use, and resource condition goals and objectives to be obtained...". Also, 4110.3-2(b) states that, "When monitoring shows that active use is causing an unacceptable level or pattern of utilization [emphasis added] or exceeds the livestock carrying capacity as determined through monitoring, the authorized officer shall reduce active use if necessary to maintain or improve rangeland productivity..."

The following degrees of allowable use were developed as a set of definitive criteria to assist in managing range land vegetation on a sustained yield basis. This table is meant to be used as an area guideline and will be tempered by site specific judgement and experience during future evaluation and activity planning efforts. For example, "flash" grazing rotation systems (high intensity - short duration with multiple rotating pastures) are presently implemented on some allotments in the Garber Block. This system may result in spring perennial grass utilization levels higher than that listed in the table (50 percent), but the higher level would be allowable due to the lengthy time after grazing for regrowth. In fact, after average regrowth, the total utilization level of *current years growth* would probably be less than 50 percent. Generally, most research has found that utilization should not exceed the moderate range (40 to 60 percent). Utilization objective levels may be adjusted downwards from the table figures for allotments/pastures where quicker improvement in condition objectives are desired. Also, the occasional exceeding of a utilization level objective on a small percentage or low resource concern portion of an allotment (such as around a water trough or salt block) may not key changes in management. However, exceeding the utilization objective on an important riparian area, though small in acreage, may well lead to changes in management. This may affect use on surrounding upland areas even though full upland utilization may have not been achieved.

For the following table, spring is considered to be the period of active vegetative growth; summer is flowering, seed production, and some regrowth; fall is cured and late regrowth. There is no winter grazing use within the Klamath Falls Resource Area. This table is generally for upland areas; riparian areas are covered in Appendix F, best management practices.

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## Degree of Allowable Use (by Percentage)

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Plant Category*	Spring	Summer	Fall	Season-long
Perennial grasses & grasslike	50	50	60	50
Perennial & biennial forbs	50	50	60	50
Shrubs, half shrubs & trees	30	50	50	45
Annual grasses & forbs	No annuals are expected to be key species			

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\* Plant category is used instead of species, as key species vary from area to area and this approach allows for wider application and greater flexibility. It is also appropriate to the general nature of this Resource Management Plan. For the types of vegetative communities found in the Klamath Falls Resource Area, research has indicated that key forage plants within each plant category have similar requirements and responses to similar utilization levels.

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## Grazing in Riparian-Wetland Areas

### Objectives

Riparian zones and wetlands would be managed to protect, maintain, or improve riparian habitat for wildlife and native plant diversity. By 1997, 75 percent of BLM-administered riparian-wetland areas would be restored or maintained in proper functioning condition. Proper functioning condition exists when adequate vegetation, landform, or large woody debris are present to: dissipate stream energy associated with high water flows; filter sediment, capture bedload and aid floodplain development; improve floodwater retention and groundwater recharge; develop stabilizing root masses, create aquatic habitat; and insulate streams for summer and winter extremes.

Grazing management practices in riparian zones would either provide for regrowth of riparian plants or leave sufficient vegetation after use for maintenance of proper functioning condition.

### Discussion

A primary mechanism for stream restoration is the development of new floodplains and banks. Paramount to this process is the presence of dense vegetation on the existing floodplain during spring flooding events to slow flood waters and allow suspended sediment to settle. Also necessary is the presence of vigorous plant growth to stabilize these new alluvial deposits. Grazing systems must accommodate these critical functions by providing residual cover for sediment filtering and good vegetative vigor for stability. Residual cover is a function of both utilization level and, for herbaceous species, post-grazing regrowth.

There is a complex set of both natural and human-controlled factors that influence the response of a riparian-wetland area to a particular grazing system. These include, but are not limited to: kind and class of stock; learned behavior of livestock social groups; non-riparian water and shade sources; terrain and weather influences; herding, riding, and salting practices; fencing locations; grazing system compliance; wildlife uses,



especially beaver and big game; soils; bank and channel vulnerability to detachment; and stream gradient and sediment load. Grazing systems which consider only upland plant growth requirements will generally not meet riparian-wetland site requirements. However, a grazing strategy designed to protect or encourage only riparian-wetland site requirements. Optimally, grazing strategies should be designed to concurrently meet the needs of both upland and riparian vegetation over time.

## Management Actions/Direction

Because of the complexity involved in managing riparian-wetland systems, there are many variation of grazing strategies that can be used in riparian-wetland areas, and no one grazing strategy will fit all situations. In general, the most successful strategies for protecting or restoring these areas incorporate one or more of the following features:

- ◆ inclusion of the riparian-wetland area within a separate pasture with separate management objectives and strategies;
- ◆ fencing or herding of livestock out of riparian-wetland areas for as long as necessary to allow vegetation to recover;
- ◆ controlling the timing of grazing to keep livestock off streambanks when they are most vulnerable to damage and to coincide with the physiological needs of target plant species;
- ◆ adding more rest of the grazing cycle to increase plant vigor, allow streambanks to heal, or encourage more desirable plant species composition;
- ◆ limiting grazing intensity to level which will maintain desired species composition and vigor;
- ◆ changing from cattle to sheep to obtain better animal distribution through herding;
- ◆ permanently excluding livestock from those riparian-wetland areas that are at high risk and have poor recovery potential, and when there is no practical way to protect them while grazing adjacent uplands.

For specific riparian-wetland areas in the Klamath Falls Resource Area, a grazing strategy would be developed using one or more of the features listed above. This grazing strategy would be developed at the activity planning level, through an allotment evaluation and the development of an Allotment Management Plan. These allotment management plans would contain allowable use guidelines for the riparian-wetlands in the allotment as part of the grazing strategy. Allowable use of forage is based on the amount of forage that will be left at the end of the overall grazing season or the end of the growing season, whichever is later. These guidelines would generally follow the utilization standards below, which include cumulative annual use by big game and livestock:

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### Maximum Annual Utilization (percent)

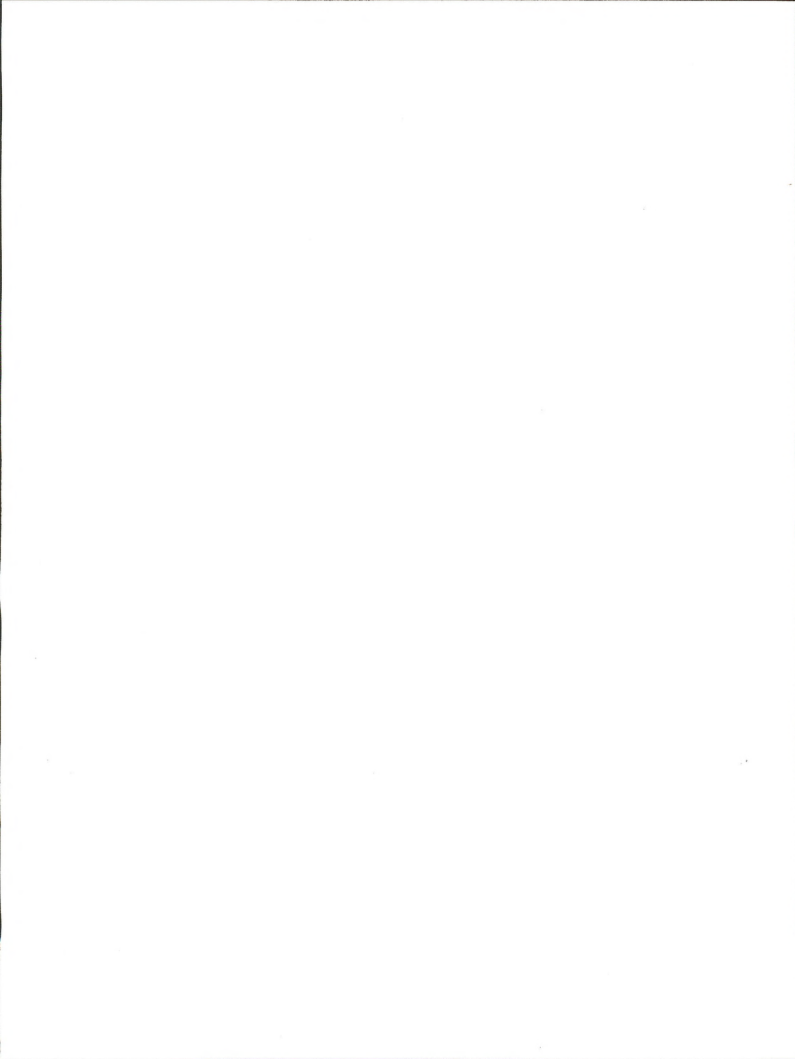
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Utilization Standards in Riparian-Wetland Areas	<u>Proper Functioning Condition</u>		<u>Functional - At Risk or Nonfunctioning</u>	
	Herbaceous	Woody	Herbaceous	Woody
Riparian Areas with Management	50	50	0-40	0-35
Riparian Areas without Management	40	30	0-30	0-25

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In addition to these allowable use guidelines, grazing would be scheduled to allow at least 30 days of post-grazing regrowth annually.

Allotment management plans could include utilization standards which are either lower or higher than those outlined above, or could prescribe late season use of riparian vegetation. This prescription could occur when associated with intensive grazing systems and specific vegetation management objectives that meet the needs of riparian-dependent resources.



# Appendix M

## Land Tenure

### Introduction

This appendix includes criteria to be used in evaluating land disposal or acquisition actions and a listing of public lands, by legal description, that may be suitable for sale, pending site-specific environmental analysis.

### Land Ownership Adjustment Criteria

In accordance with the Federal Land Policy and Management Act of 1976 (FLPMA) and other laws, Executive Orders, and Departmental and Bureau policy the following criteria that would be used to evaluate opportunities for disposal or acquisition. This list is not considered all inclusive, but represents the major factors to be evaluated. They include:

- ◆ Threatened, endangered, or sensitive plant and animal species habitat;
- ◆ Riparian areas and wetlands;
- ◆ Nesting/breeding habitat for game and non-game animals;
- ◆ Key big game seasonal habitat;
- ◆ Developed recreation sites and recreation use areas;
- ◆ High quality scenery;
- ◆ Land adjacent to rivers eligible for designation under the National Wild and Scenic Rivers Act;
- ◆ Significant cultural resources and sites eligible for inclusion on the National Register of Historic Places;
- ◆ Designated wilderness areas and areas being studied for possible wilderness designation;
- ◆ Accessibility of the land for public recreation and other uses;
- ◆ Amount of public investments in facilities or improvements and the potential for recovering those investments;
- ◆ Difficulty or cost of administration (manageability);
- ◆ Suitability of the land for management by another federal agency;
- ◆ Significance of the decision in stabilizing business, social and economic conditions, and/or lifestyles;
- ◆ Whether private sites exist for the proposed use;
- ◆ Encumbrances, including but not limited to, withdrawals or existing leases or permits;

- ♦ Consistency with cooperative agreements and plans or policies of other agencies; and
- ♦ Suitability (need for change in land ownership or use) for purposes, including but not limited to, community expansion or economic development, such as industrial, residential, or agricultural (other than grazing) developments.

## Zone 3 Lands

The following lands are potentially suitable for disposal through sale under section 203(a) of FLPMA if important recreation, wildlife, watershed, threatened or endangered species habitat, and/or cultural values are not identified during disposal clearance reviews and no viable exchange proposals for them can be identified. These lands would also be available for transfer to another agency or to local governments, as needed, to accommodate community expansion and other public purposes.

Legal Description	Size (acres)
<b>T. 39 S., R. 5 E.</b>	
Sec. 17 - NW¼NW¼, SW¼NW¼, NW¼SW¼	120.00
Sec. 21 - SW¼SW¼	40.00
Sec. 29 - NW¼	160.00
Sec. 31 - N½	320.00
Sec. 33 - NW¼SW¼	40.00
<b>T. 40 S., R. 5 E.</b>	
Sec. 7 - W¼	320.00
Sec. 31 - NE¼NW¼, W¼W¼, SE¼SW¼, S¼SE¼	320.00
<b>T. 39 S., R. 6 E.</b>	
Sec. 22 - SE¼NW¼	40.00
Sec. 23 - W¼SW¼	80.00
Sec. 26 - SW¼NE¼	40.00
Sec. 35 - NE¼NE¼, SE¼NW¼, S¼SW¼, SE¼	320.00
<b>T. 41 S., R. 7 E.</b>	
Sec. 13 - NE¼NE¼	40.00
Lot 4	24.69
<b>T. 38 S., R. 8 E.</b>	
Sec. 31 - Lot 4	10.30
<b>T. 39 S., R. 8 E.</b>	
Sec. 6 - Lot 6	27.20
Sec. 7 - Lot 5	16.90
Sec. 33 - Lot 1 the unpatented portion of	4.42

Legal Description	Size (acres)
T. 40 S., R. 8 E.	
Sec. 17 - SW $\frac{1}{4}$ SE $\frac{1}{4}$	40.00
Sec. 21 - SW $\frac{1}{4}$ SE $\frac{1}{4}$	40.00
Sec. 22 - Lot 4	38.00
Sec. 28 - SE $\frac{1}{4}$ NE $\frac{1}{4}$ , W $\frac{1}{4}$ NE $\frac{1}{4}$ , NW $\frac{1}{4}$ SE $\frac{1}{4}$	160.00
Sec. 32 - S $\frac{1}{4}$ NE $\frac{1}{4}$	80.00
T. 41 S., R. 8 E.	
Sec. 8 - NW $\frac{1}{4}$ NW $\frac{1}{4}$ , S $\frac{1}{4}$ N $\frac{1}{4}$ , E $\frac{1}{4}$ SW $\frac{1}{4}$ , SE $\frac{1}{4}$	440.00
Sec. 17 - NE $\frac{1}{4}$ NE $\frac{1}{4}$	40.00
T. 37 S., R. 9 E.	
Sec. 3 - SE $\frac{1}{4}$ NW $\frac{1}{4}$ , NE $\frac{1}{4}$ SW $\frac{1}{4}$	80.00
Sec. 4 - SW $\frac{1}{4}$ SW $\frac{1}{4}$	40.00
Sec. 6 - SE $\frac{1}{4}$ NW $\frac{1}{4}$	40.00
Sec. 7 - NE $\frac{1}{4}$ NE $\frac{1}{4}$	40.00
Sec. 8 - E $\frac{1}{4}$ SW $\frac{1}{4}$	80.00
Sec. 9 - NW $\frac{1}{4}$ NW $\frac{1}{4}$ , NE $\frac{1}{4}$ SW $\frac{1}{4}$	80.00
Sec. 13 - NE $\frac{1}{4}$ SE $\frac{1}{4}$ , W $\frac{1}{4}$ W $\frac{1}{4}$	200.00
Sec. 14 - NE $\frac{1}{4}$ NE $\frac{1}{4}$ , SE $\frac{1}{4}$ SE $\frac{1}{4}$	80.00
Sec. 17 - W $\frac{1}{4}$ E $\frac{1}{4}$ , NE $\frac{1}{4}$ NW $\frac{1}{4}$	200.00
Sec. 20 - N $\frac{1}{4}$ NE $\frac{1}{4}$ , SE $\frac{1}{4}$ NE $\frac{1}{4}$	120.00
Sec. 21 - SW $\frac{1}{4}$ NW $\frac{1}{4}$ , NW $\frac{1}{4}$ SW $\frac{1}{4}$ , SE $\frac{1}{4}$ SW $\frac{1}{4}$	120.00
Sec. 28 - W $\frac{1}{4}$ NW $\frac{1}{4}$ , SW $\frac{1}{4}$ NE $\frac{1}{4}$ , NW $\frac{1}{4}$ SE $\frac{1}{4}$ , SE $\frac{1}{4}$ SE $\frac{1}{4}$	200.00
Sec. 35 - SE $\frac{1}{4}$ NE $\frac{1}{4}$	40.00
T. 38 S., R. 9 E.	
Sec. 3 - SE $\frac{1}{4}$ NE $\frac{1}{4}$ , SE $\frac{1}{4}$ SE $\frac{1}{4}$	80.00
Sec. 5 - SW $\frac{1}{4}$ SE $\frac{1}{4}$	40.00
Sec. 8 - NE $\frac{1}{4}$ NE $\frac{1}{4}$	40.00
Sec. 9 - NW $\frac{1}{4}$ NW $\frac{1}{4}$ , SE $\frac{1}{4}$ SW $\frac{1}{4}$	80.00
Sec. 15 - SW $\frac{1}{4}$ SW $\frac{1}{4}$	40.00
T. 40 S., R. 9 E.	
Sec. 23 - SW $\frac{1}{4}$ NW $\frac{1}{4}$	40.00
Sec. 35 - N $\frac{1}{4}$ NE $\frac{1}{4}$ , SE $\frac{1}{4}$ NE $\frac{1}{4}$	120.00
T. 37 S., R. 10 E.	
Sec. 12 - S $\frac{1}{4}$ SE $\frac{1}{4}$	80.00
Sec. 13 - NE $\frac{1}{4}$ NW $\frac{1}{4}$	40.00



Legal Description	Size (acres)
T. 38 S., R. 10 E.	
Sec. 6 - Lot 5	39.80
Lot 6	39.96
Lot 7	40.12
NE $\frac{1}{4}$ SW $\frac{1}{4}$	40.00
Sec. 7 - NE $\frac{1}{4}$ NE $\frac{1}{4}$ , NE $\frac{1}{4}$ NW $\frac{1}{4}$	80.00
Sec. 27 - NE $\frac{1}{4}$ SE $\frac{1}{4}$ , S $\frac{1}{2}$ SW $\frac{1}{4}$	120.00
Sec. 28 - W $\frac{1}{2}$ E $\frac{1}{4}$ , SE $\frac{1}{4}$ SE $\frac{1}{4}$	200.00
Sec. 30 - Lot 2	39.80
Lot 3	39.72
Lot 4	39.66
Sec. 31 - Lot 1	39.65
Lot 2	39.75
Lot 3	39.85
E $\frac{1}{2}$ E $\frac{1}{4}$ , SW $\frac{1}{4}$ NE $\frac{1}{4}$ , E $\frac{1}{4}$ SW $\frac{1}{4}$	280.00
Sec. 32 - N $\frac{1}{4}$ NE $\frac{1}{4}$ , SW $\frac{1}{4}$ NE $\frac{1}{4}$ , SW $\frac{1}{4}$ NW $\frac{1}{4}$ , W $\frac{1}{4}$ SW $\frac{1}{4}$ , SE $\frac{1}{4}$	400.00
Sec. 33 - W $\frac{1}{2}$ NE $\frac{1}{4}$ , N $\frac{1}{4}$ SW $\frac{1}{4}$ , SE $\frac{1}{4}$ SW $\frac{1}{4}$ , W $\frac{1}{4}$ SE $\frac{1}{4}$	280.00
Sec. 34 - N $\frac{1}{4}$ NW $\frac{1}{4}$	80.00
Sec. 35 - NE $\frac{1}{4}$ SW $\frac{1}{4}$	40.00
T. 39 S., R. 10 E.	
Sec. 4 - Lot 1	41.40
Lot 2	41.40
Lot 3	41.50
S $\frac{1}{2}$ NE $\frac{1}{4}$ , SE $\frac{1}{4}$ NW $\frac{1}{4}$ , N $\frac{1}{4}$ SW $\frac{1}{4}$ , SW $\frac{1}{4}$ SW $\frac{1}{4}$	240.00
Sec. 5 - Lot 2	41.03
Lot 3	41.68
Lot 4	40.34
S $\frac{1}{2}$ NE $\frac{1}{4}$ , SE $\frac{1}{4}$ SE $\frac{1}{4}$	120.00
Sec. 10 - S $\frac{1}{2}$ SE $\frac{1}{4}$	80.00
Sec. 23 - W $\frac{1}{2}$ E $\frac{1}{4}$ , E $\frac{1}{2}$ W $\frac{1}{4}$ , SW $\frac{1}{4}$ SW $\frac{1}{4}$	360.00
Sec. 24 - S $\frac{1}{2}$ NE $\frac{1}{4}$	80.00
Sec. 25 - S $\frac{1}{2}$ NE $\frac{1}{4}$ , NW $\frac{1}{4}$ , SE $\frac{1}{4}$	400.00
Sec. 26 - N $\frac{1}{2}$	320.00
Sec. 32 - NE $\frac{1}{4}$ SW $\frac{1}{4}$ , SW $\frac{1}{4}$ SE $\frac{1}{4}$	80.00
Sec. 32 - SE $\frac{1}{4}$ NE $\frac{1}{4}$	40.00
Sec. 33 - SE $\frac{1}{4}$ NE $\frac{1}{4}$	40.00
Sec. 34 - S $\frac{1}{2}$	320.00
T. 37 S., R. 11 E.	
Sec. 15 - NW $\frac{1}{4}$ NW $\frac{1}{4}$	40.00
Sec. 23 - NW $\frac{1}{4}$ NW $\frac{1}{4}$	40.00

Legal Description	Size (acres)
Sec. 26 - SW $\frac{1}{4}$	160.00
Sec. 27 - E $\frac{1}{2}$ SW $\frac{1}{4}$ , SE $\frac{1}{4}$	240.00
Sec. 29 - N $\frac{1}{2}$ SW $\frac{1}{4}$ , SE $\frac{1}{4}$ SW $\frac{1}{4}$	120.00
Sec. 30 - N $\frac{1}{2}$ SE $\frac{1}{4}$	80.00
Sec. 33 - SE $\frac{1}{4}$ NW $\frac{1}{4}$ , W $\frac{1}{2}$ SE $\frac{1}{4}$	120.00
Sec. 34 - E $\frac{1}{2}$ , NE $\frac{1}{4}$ NW $\frac{1}{4}$ , N $\frac{1}{2}$ SW $\frac{1}{4}$ , SE $\frac{1}{4}$ SW $\frac{1}{4}$	480.00
Sec. 35 - W $\frac{1}{2}$ , S $\frac{1}{2}$ NE $\frac{1}{4}$ , SE $\frac{1}{4}$	560.00
T. 38 S., R. 11 E.	
Sec. 1 - W $\frac{1}{2}$ SW $\frac{1}{4}$ , SE $\frac{1}{4}$ SW $\frac{1}{4}$	120.00
Sec. 2 - Lot 4	41.43
S $\frac{1}{2}$ NW $\frac{1}{4}$ , SW $\frac{1}{4}$ , NE $\frac{1}{4}$ SE $\frac{1}{4}$	280.00
Sec. 3 - Lot 1	41.46
Lot 2	41.35
Lot 3	41.24
S $\frac{1}{2}$ NE $\frac{1}{4}$ , SE $\frac{1}{4}$ NW $\frac{1}{4}$ , SE $\frac{1}{4}$	280.00
Sec. 10 - E $\frac{1}{2}$ , E $\frac{1}{2}$ NW $\frac{1}{4}$ , NE $\frac{1}{4}$ SW $\frac{1}{4}$	440.00
Sec. 11 - SW $\frac{1}{4}$ SW $\frac{1}{4}$ , S $\frac{1}{2}$ SE $\frac{1}{4}$	120.00
Sec. 12 - SW $\frac{1}{4}$ NE $\frac{1}{4}$ , W $\frac{1}{2}$ NW $\frac{1}{4}$ , SE $\frac{1}{4}$ NW $\frac{1}{4}$ , N $\frac{1}{2}$ SW $\frac{1}{4}$ , SE $\frac{1}{4}$ SW $\frac{1}{4}$ , E $\frac{1}{2}$ SE $\frac{1}{4}$	360.00
Sec. 13 - W $\frac{1}{2}$ NE $\frac{1}{4}$ , NW $\frac{1}{4}$ , E $\frac{1}{2}$ SW $\frac{1}{4}$ , W $\frac{1}{2}$ SE $\frac{1}{4}$	400.00
Sec. 14 - W $\frac{1}{2}$ NE $\frac{1}{4}$ , N $\frac{1}{2}$ NW $\frac{1}{4}$ , SE $\frac{1}{4}$ NW $\frac{1}{4}$ , E $\frac{1}{2}$ SE $\frac{1}{4}$ , SE $\frac{1}{4}$ SE $\frac{1}{4}$	320.00
Sec. 17 - NW $\frac{1}{4}$ NE $\frac{1}{4}$ , E $\frac{1}{2}$ SE $\frac{1}{4}$	120.00
Sec. 19 - SE $\frac{1}{4}$ SE $\frac{1}{4}$	40.00
Sec. 20 - S $\frac{1}{2}$ SW $\frac{1}{4}$ , SW $\frac{1}{4}$ SE $\frac{1}{4}$	120.00
Sec. 21 - E $\frac{1}{2}$ SW $\frac{1}{4}$ , SW $\frac{1}{4}$ SE $\frac{1}{4}$	160.00
Sec. 22 - S $\frac{1}{2}$ NE $\frac{1}{4}$ , N $\frac{1}{2}$ SE $\frac{1}{4}$ , SE $\frac{1}{4}$ SE $\frac{1}{4}$	200.00
Sec. 23 - E $\frac{1}{2}$ , S $\frac{1}{2}$ SW $\frac{1}{4}$	400.00
Sec. 26 - N $\frac{1}{2}$ NE $\frac{1}{4}$ , SE $\frac{1}{4}$ NE $\frac{1}{4}$ , W $\frac{1}{2}$	440.00
Sec. 27 - SW $\frac{1}{4}$ NW $\frac{1}{4}$ , SW $\frac{1}{4}$	200.00
Sec. 28 - NW $\frac{1}{4}$ NE $\frac{1}{4}$ , SE $\frac{1}{4}$ NE $\frac{1}{4}$ , N $\frac{1}{2}$ NW $\frac{1}{4}$ , NE $\frac{1}{4}$ SE $\frac{1}{4}$	200.00
Sec. 29 - E $\frac{1}{2}$ , N $\frac{1}{2}$ NW $\frac{1}{4}$	400.00
Sec. 30 - E $\frac{1}{2}$ E $\frac{1}{2}$	160.00
Sec. 32 - NE $\frac{1}{4}$ SW $\frac{1}{4}$ , NW $\frac{1}{4}$ SE $\frac{1}{4}$	80.00
Sec. 34 - NE $\frac{1}{4}$ NW $\frac{1}{4}$ , S $\frac{1}{2}$ NE $\frac{1}{4}$ , NW $\frac{1}{4}$ SE $\frac{1}{4}$	160.00
Sec. 35 - W $\frac{1}{2}$ , E $\frac{1}{2}$ NE $\frac{1}{4}$ , SW $\frac{1}{4}$ NE $\frac{1}{4}$	440.00
T. 39 S., R. 11 E.	
Sec. 2 - Lot 1	40.24
Lot 3	39.60
Lot 4	39.62
Sec. 33 - E $\frac{1}{2}$ NE $\frac{1}{4}$	80.00
Sec. 34 - SW $\frac{1}{4}$ NW $\frac{1}{4}$ , W $\frac{1}{2}$ SW $\frac{1}{4}$	120.00

Legal Description	Size (acres)
T. 40 S., R. 12 E.	
Sec. 10 - NE $\frac{1}{4}$ NE $\frac{1}{4}$ , SE $\frac{1}{4}$ NW $\frac{1}{4}$ , W $\frac{1}{2}$ SE $\frac{1}{4}$	160.00
Sec. 11 - Lot 1	41.20
Sec. 14 - SE $\frac{1}{4}$ NW $\frac{1}{4}$ , N $\frac{1}{2}$ SW $\frac{1}{4}$ , SW $\frac{1}{4}$ SW $\frac{1}{4}$ , NW $\frac{1}{4}$ SE $\frac{1}{4}$	200.00
Sec. 15 - N $\frac{1}{2}$ NE $\frac{1}{4}$ , SE $\frac{1}{4}$ SW $\frac{1}{4}$ , N $\frac{1}{2}$ SW $\frac{1}{4}$	200.00
Sec. 19 - N $\frac{1}{2}$ NE $\frac{1}{4}$ , SE $\frac{1}{4}$ NE $\frac{1}{4}$	120.00
Sec. 20 - N $\frac{1}{2}$ N $\frac{1}{2}$ , SE $\frac{1}{4}$ NE $\frac{1}{4}$ , NE $\frac{1}{4}$ SE $\frac{1}{4}$	240.00
Sec. 21 - SW $\frac{1}{4}$ NE $\frac{1}{4}$ , E $\frac{1}{4}$ , NE $\frac{1}{4}$ SE $\frac{1}{4}$	400.00
Sec. 22 - SW $\frac{1}{4}$ NE $\frac{1}{4}$ , SE $\frac{1}{4}$ NW $\frac{1}{4}$ , SW $\frac{1}{4}$ SW $\frac{1}{4}$	120.00
Sec. 26 - W $\frac{1}{2}$ SE $\frac{1}{4}$ , SE $\frac{1}{4}$ SE $\frac{1}{4}$	120.00
Sec. 27 - W $\frac{1}{2}$ NE $\frac{1}{4}$ , SE $\frac{1}{4}$ NE $\frac{1}{4}$ , W $\frac{1}{2}$ NW $\frac{1}{4}$ , SE $\frac{1}{4}$ NW $\frac{1}{4}$	240.00
Sec. 28 - E $\frac{1}{2}$ NW $\frac{1}{4}$	80.00
Sec. 35 - NE $\frac{1}{4}$ NE $\frac{1}{4}$	40.00
T. 37 S., R. 11 $\frac{1}{2}$ E.	
Sec. 11 - NE $\frac{1}{4}$ , N $\frac{1}{2}$ SE $\frac{1}{4}$	240.00
Sec. 13 - E $\frac{1}{2}$ NW $\frac{1}{4}$	80.00
Sec. 14 - SE $\frac{1}{4}$ NE $\frac{1}{4}$	40.00
Sec. 17 - SE $\frac{1}{4}$ SW $\frac{1}{4}$	40.00
Sec. 20 - NE $\frac{1}{4}$ SE $\frac{1}{4}$	40.00
Sec. 21 - NW $\frac{1}{4}$ NE $\frac{1}{4}$ , S $\frac{1}{2}$ NE $\frac{1}{4}$ , N $\frac{1}{2}$ NW $\frac{1}{4}$ , N $\frac{1}{2}$ SE $\frac{1}{4}$ , SE $\frac{1}{4}$ SE $\frac{1}{4}$	320.00
Sec. 22 - W $\frac{1}{2}$ SW $\frac{1}{4}$	80.00
Sec. 26 - NE $\frac{1}{2}$ NW $\frac{1}{4}$	40.00
Sec. 27 - NW $\frac{1}{4}$ SW $\frac{1}{4}$	40.00
Sec. 28 - SW $\frac{1}{4}$ NE $\frac{1}{4}$ , W $\frac{1}{2}$ NW $\frac{1}{4}$ , SE $\frac{1}{4}$ NW $\frac{1}{4}$ , NW $\frac{1}{4}$ SW $\frac{1}{4}$ ,	200.00
Sec. 29 - SE $\frac{1}{4}$ NE $\frac{1}{4}$ , E $\frac{1}{2}$ SW $\frac{1}{4}$ , E $\frac{1}{2}$ SE $\frac{1}{4}$	200.00
T. 39 S., R. 11 $\frac{1}{2}$ E.	
Sec. 9 - S $\frac{1}{2}$ NE $\frac{1}{4}$	80.00
Sec. 10 - SW $\frac{1}{4}$ NW $\frac{1}{4}$	40.00
Sec. 21 - NE $\frac{1}{4}$ NE $\frac{1}{4}$	40.00
T. 38 S., R. 12 E.	
Sec. 5 - W $\frac{1}{2}$ SW $\frac{1}{4}$	80.00
Sec. 6 - NE $\frac{1}{4}$ SE $\frac{1}{4}$	40.00
T. 39 S., R. 12 E.	
Sec. 21 - NE $\frac{1}{4}$ NE $\frac{1}{4}$	40.00
Sec. 26 - NW $\frac{1}{4}$ SE $\frac{1}{4}$ , SE $\frac{1}{4}$ SE $\frac{1}{4}$	80.00
Sec. 27 - E $\frac{1}{2}$ SE $\frac{1}{4}$	280.00
Sec. 28 - NE $\frac{1}{4}$ SW $\frac{1}{4}$	40.00
Sec. 34 - NW $\frac{1}{4}$ NW $\frac{1}{4}$	40.00

Legal Description	Size (acres)
T. 40 S., R. 13 E.	
Sec. 35 - SW $\frac{1}{4}$ NE $\frac{1}{4}$	40.00
T. 41 S., R. 13 E.	
Sec. 14 - NE $\frac{1}{4}$ NW $\frac{1}{4}$	40.00
T. 37 S., R. 13 E.	
Sec. 1 - Lot 5	9.88
Lot 7	9.88
Sec. 11 - NW $\frac{1}{4}$ SE $\frac{1}{4}$	40.00
T. 37 S., R. 14 E.	
Sec. 10 - NW $\frac{1}{4}$ NE $\frac{1}{4}$ , N $\frac{1}{2}$ SW $\frac{1}{4}$ NE $\frac{1}{4}$ , N $\frac{1}{2}$ S $\frac{1}{2}$ SW $\frac{1}{4}$ NE $\frac{1}{4}$	70.00
T. 41 S., R. 14 E.	
Sec. 5 - NE $\frac{1}{4}$ SE $\frac{1}{4}$	40.00
T. 36 S., R. 15 E.	
Sec. 28 - All	640.00
Sec. 30 - Lot 1	40.25
Lot 2	40.18
Lot 3	40.11
Lot 4	40.04
E $\frac{1}{2}$ W $\frac{1}{2}$ , E $\frac{1}{2}$	480.00
Sec. 32 - All	640.00
T. 37 S., R. 15 E.	
Sec. 4 - Lot 1	40.73
Lot 2	41.03
Lot 3	40.91
Lot 4	40.64
Lot 5	40.11
Lot 6	40.21
Lot 7	40.54
Lot 8	40.64
Lot 9	40.68
Lot 10	40.44
Lot 11	40.02
Lot 12	39.96
Lot 13	40.13
Lot 14	40.19
Lot 15	40.55
Lot 16	40.79

Legal Description	Size (acres)
T. 40 S., R. 15 E.	
Sec. 21 - NE $\frac{1}{4}$ NE $\frac{1}{4}$ , SE $\frac{1}{4}$ NW $\frac{1}{4}$	80.00
T. 41 S., R. 15 E.	
Sec. 3 - SW $\frac{1}{4}$ NE $\frac{1}{4}$	40.00
Sec. 11 - E $\frac{1}{4}$ NE $\frac{1}{4}$ , NE $\frac{1}{4}$ SE $\frac{1}{4}$	120.00
Grand total	23,671.22

# Appendix N

## Mineral and Non-Mineral Development Scenarios

### Introduction

This appendix has five main sections, which describe the reasonably foreseeable development scenarios for development of leasable, locatable, and salable mineral commodities and alternative non-mineral energy development. The purpose of the reasonably foreseeable development scenario is to provide a model that anticipates the level and type of future mineral activity in the planning area, and would serve as a basis for cumulative effects analysis. The reasonably foreseeable development scenario first describes the steps involved in developing a mineral deposit, with presentation of hypothetical exploration and mining operations. The current activity levels are discussed in Chapter 3 of this document. Future trends and assumptions affecting mineral activity are discussed here, followed by the prediction and identification of anticipated mineral exploration and development. Finally there is a discussion on possible energy development scenarios (such as solar, wind, and pumped storage) for the planning area. The main focus of this section is the proposed Salt Caves hydroelectric project.

### Scope

The development scenario is limited in scope to BLM-administered lands in the planning area. The reasonably foreseeable development scenario is based on the known or inferred mineral resource capabilities of the lands involved, and applies the conditions and assumptions discussed under Future Trends and Assumptions. Changes in available geologic data and/or economic conditions would alter the reasonably foreseeable development, and some deviation should be expected over time.

### Leasable Mineral Resources

#### Reasonably Foreseeable Development of Oil and Gas (Common to All Alternatives)

**Future Trends and Assumptions.** Based on the history of past drilling and foreseeable development potential in the Klamath Falls Resource Area, activity over the next ten to fifteen years would continue to be sporadic. It is anticipated that oil and gas activity will consist of the issuance of some competitive and over-the-counter leases, a few geophysical surveys, and perhaps the drilling of one or two exploratory holes.

Because of the low potential for development of hydrocarbons, even though the potential for occurrence is moderate, the BLM does not anticipate the discovery of a producible oil and gas field during the life of this plan; however, to comply with the Supplemental Program Guidance for Fluid Minerals (Manual Section 1624.2), the potential surface effects associated with the discovery and development of a small oil and gas field are given in the section titled Oil and Gas Exploration and Development Scenario.

#### Oil and Gas Exploration and Development Scenario

**Geophysical Exploration.** Geophysical exploration is conducted to try and determine the subsurface structure of an area. Three geophysical survey techniques are generally used to define subsurface characteristics through measurements of the gravitational field, magnetic field, and seismic reflections.



Gravity and magnetic field surveys involve small portable measuring units that are easily transported via light off-highway vehicles, such as four-wheel drive pickup trucks and jeeps, or aircraft. Both off- and on-highway travel may be necessary in these two types of surveys. Usually a three-man crew transported by one or two vehicles is required. Sometimes small holes (approximately one inch by two inches by two inches) are hand dug for instrument placement at the survey measurement points. These two survey methods can make measurements along defined lines, but it is more common to have a grid of distinct measurement stations.

Seismic reflection surveys are the most common of the geophysical methods, and they produce the most detailed subsurface information. Seismic surveys are conducted by sending shock waves, generated by a small explosion or through mechanically beating the ground surface with a thumping or vibrating platform, through the earth's surface. Usually four large trucks are used, each equipped with pads about four-foot square. The pads are lowered to the ground, and the vibrators are electronically triggered from the recording truck. Once information is recorded, the trucks move forward a short distance and the process is repeated. Less than fifty square feet of surface area is required to operate the equipment at each recording site.

The explosive method requires that small charges be detonated on the surface or in a drill hole. Holes for the charges are drilled using truck-mounted or air portable drills. The holes are of small diameter (two to six inches) and reach depths of 100 to 200 feet. Generally four to twelve holes are drilled per mile of line and a five- to fifty-pound explosive charges is placed in the hole, covered, and detonated. The shock wave created is recorded by geophones placed in a linear fashion on the surface. In rugged terrain, a portable drill carried by helicopter can sometimes be used. A typical seismic drilling operation may use ten to fifteen men operating five to seven trucks. Under normal conditions, three to five miles of line can be surveyed daily using this method. The vehicles used for a drilling program may include heavy truck-mounted drill rigs, track-mounted air rigs, water trucks, a computer recording truck, and several light pickup trucks for the surveyors, shot hole crew, geophone crew, permit man, and party chief.

Public and private roads and trails are used where possible; however, off-highway cross-country travel is necessary in some cases. Graders and bulldozers may be required to provide access to remote areas. Several trips a day are made along a seismograph line, usually resulting in a well defined two-track trail. Drilling water, when needed, is usually obtained from private landowners.

The surface charge method uses one- to five-pound charges attached to wooden laths three to eight feet above the ground. Placing charges lower than six feet usually results in the destruction of vegetation, while placing the charges higher, or on the surface of deep snow, results in little visible surface disturbance.

It is anticipated that two notices of intent, involving seismic reflection and gravity/magnetic field surveys, would be filed under any of the alternatives during the life of the plan.

**Drilling Phase.** Once the application to drill is approved, the operator may begin construction activities in accordance with stipulations and conditions. When a site is chosen that necessitates the construction of an access road, the length of road may vary, but usually the shortest feasible route is selected to reduce the haul distance and construction costs. Environmental factors or a landowner's wishes could dictate a longer route in some cases. Drilling activity in the planning area is predicted to be done using existing roads and only constructing short (approximately ¼ mile) roads to access drill site locations.

Based on past oil and gas drilling in Oregon, it is projected that one or two exploratory wildcat wells would be drilled on BLM-administered land in the planning area. The estimated success rate of finding hydrocarbons is predicted to be no greater than ten percent, based on the average wildcat well success rate. Drilling is expected to be in areas of moderate oil and gas potential. This is the highest level of potential for the occurrence of oil and gas in the planning area. There is approximately a one in fifty chance of a new field discovery during the life of the plan, with a strong likelihood that any such discovery would be natural gas, since current western Oregon production is gas.

During the first phase of drilling, the operator would move construction equipment over existing maintained roads to the point where the access road begins. Less than ¼ mile of moderate duty access road with a cinder or gravel surface eighteen to twenty feet wide is anticipated for construction. The total surface disturbance width

would average forty feet with ditches, cuts, and fills. The second part of the drilling phase would be the construction of the drilling pad or platform. The likely duration of well development, testing, and abandonment is predicted to be less than twelve months per drill site. The total disturbance for each exploratory well and any new road construction to the drill site is expected to be less than six acres. The total surface disturbance caused by exploratory drilling over the life of the plan is expected to be less than twelve acres.

**Field Development and Production.** No field development is expected to occur during the life of the plan; however, the following scenario describes the operations and effects associated with field development and production.

Small deposits of oil or gas discovered in the planning area would not be economic to develop. The minimum size considered economically feasible would be a field containing reserves of 50 to 60 billion cubic feet of gas over a productive life span of 10 years. The total area of such a field would be 200 acres with a likely well spacing of 160 acres. The field would require four development wells in addition to the discovery well. Each development well would require  $\frac{1}{4}$  mile of road. Development well access roads would be cinder or gravel surfaced and would have a width of about twenty feet. The width of the surface disturbance associated with roads would average forty feet. Gas produced would be carried by pipelines which could possibly be linked to the existing and proposed gas transmission lines in the planning area. Average pipeline length is estimated at thirty to forty miles. The width of surface disturbance for pipelines would average thirty feet. Any oil produced would be trucked to refineries outside of Oregon. Well servicing requirements would be provided by established service companies.

The total surface disturbance would be eight acres for well pads; five acres for roads; thirteen acres for field development; and 600 acres for pipelines. The total surface disturbance caused by exploration and development over the life of the plan would be 670 acres.

**Plugging and Abandonment.** Wells that are completed as dry holes are plugged according to a plan designed specifically for the conditions of each well. Plugging is accomplished by the placing of cement plugs at strategic locations in the hole. Drilling mud is used as a spacer between the plugs to prevent communication between fluid bearing zones. The drill casing is cut off at least three feet below ground level and capped by welding a steel plate on the casing stub. After plugging, all equipment and debris would be removed and the site restored as near as reasonably possible to its original condition. It is predicted that the one anticipated exploratory well that would be drilled would be plugged and abandoned.

## Reasonably Foreseeable Development of Geothermal Resources (Common to All Alternatives)

**Future Trends and Assumptions.** Since environmental protection and enhancement are major concerns in the Pacific Northwest, clean, low-impacting energy sources are becoming more important. The energy surplus in the region is expected to disappear by the end of the decade. The abundant geothermal resources thought to be present in the northwest are essentially undeveloped. To encourage resource development, the Bonneville Power Administration is participating in two geothermal pilot projects in Oregon. With this renewed interest in geothermal energy it is anticipated that areas exhibiting geothermal potential, such as Klamath Falls, will experience an increase in geothermal exploration and possibly development.

### Geothermal Operations

**Geophysical/Geochemical Exploration.** As with oil and gas, geothermal/geophysical operations can take place on leased or unleased public land. Depending upon the status of the land (leased or unleased), the status of the applicant (lessee or non-lessee), and the type of geophysical operation proposed (drilling or non-drilling), several types of authorizations can be used if the proposed exploration exceeds *casual use*, as defined in 43 Code of Federal Regulations 3209.0-5(c). In all cases, the authorizations require compliance with the National Environmental Policy Act and approval by the authorized officer (appropriate level BLM signing official).

## Appendix N - Mineral and Non-Mineral Development Scenarios

As with oil and gas, the operator is required to comply with all terms and conditions of the permits, regulations, and other requirements, including reclamation, prescribed by the authorized officer. Monitoring for compliance with these requirements would be done during the execution and upon completion of the operations.

In addition to the geophysical methods discussed in the Oil and Gas section, the following exploration techniques are often employed in geothermal prospecting:

**Microseismic.** Small seismometers are buried at a shallow depth (hand-dug holes) and transmit signals from naturally-occurring, extremely minor seismic activity (micro-earthquakes) to an amplifier on the surface. Stations are located away from roads to avoid traffic noise. These units are often backpacked into areas inaccessible to vehicles.

**Resistivity.** Induced polarization techniques are used to measure the resistance of subsurface rocks to the passage of an electric current. A vehicle-mounted transmitter sends pulses of electrical current into the ground through two widely spaced electrodes (usually about two miles apart). The behavior of these electrical pulses as they travel through underlying rocks is recorded by *pots* (potential electrodes), small ceramic devices that receive the current at different locations. The electrodes are either short rods (two or three feet long) driven into the ground, or aluminum foil shallowly buried over an area of several square feet. Two or three small trucks transport the crew of three to five people to transmitting and receiving sites.

**Telluric.** A string of *pots* record the variations in the natural electrical currents in the earth. No transmitter is required. Small trucks are used to transport the crew and equipment.

**Radiometric.** Radioactive emissions (generally radon gas) associated with geothermal resources are usually measured using a hand-held scintillometer, often at hot spring locations. Another method used involves placing plastic cups containing small detector strips sensitive to alpha radiation either on the surface or in shallow hand-dug holes. If holes are dug, they are covered, and the cups left in place for three to four weeks. At the end of the sampling period, the cups are retrieved and all holes are backfilled. These surveys can be conducted by walking to the sites or with the aid of light vehicles.

**Geochemical Surveys.** Geochemical surveys are usually conducted at hot springs by taking water samples directly from the spring. Sampling for mercury associated with geothermal resources is often done by taking soil samples using hand tools. These surveys can be conducted by walking to the sites or with the aid of light vehicles.

**Temperature Gradient Drill Hole Surveys.** Temperature gradient holes are used to determine the rate of change of temperature with respect to depth. Temperature gradient holes usually vary in diameter from about 3.5 to 4.5 inches, and from a few hundred feet to 5,000 feet in depth. They are drilled using rotary or coring methods. Approximately  $\frac{1}{10}$  to  $\frac{1}{4}$  acre per drill hole would be disturbed. A typical drill site could contain the drill rig, most likely truck-mounted; water tank(s); fuel tank; supply trailer; and a small trailer for the workers. Drilling mud and fluids would be contained in earthen pits or steel tanks. Water for drilling would be hauled in water trucks, or if suitable water sources are close, could be piped directly to the site. Water consumption could range from about 2,000 to 6,000 gallons per day, with as much as 20,000 gallons per day under extreme *lost circulation* conditions.

Other equipment that could be used includes large flatbed trucks to haul drill rod, casing, and other drilling supplies; in some cases special cementing and bulk cement trucks; and two or three small vehicles for transporting workers. In most cases, existing roads would be used. It is estimated that short spur trails (usually less than a few hundred yards long) would be bladed for less than ten percent of these holes. All holes would be plugged and abandoned to protect both surface and subsurface resources, including aquifers, and reclamation of disturbed areas would be required, unless some benefit to the public could be gained (for example, a water well or camping area).

Depending upon the location and proposed depth of the drill hole, detailed plans of operation that cover drilling methods, casing and cementing programs, well control, and plugging and abandonment could be required. Based upon past geothermal exploration in Oregon, and a projected increase in power demand in the northwest by the end of the decade, it is anticipated that during the life of the plan, six notices of intent for surface geophysical surveys, and five notices of intent to drill thirty temperature gradient holes, would be filed under any alternative. These notices of intent would most likely be filed within the Klamath Falls known geothermal resource area and the Swan Lake area.

**Drilling and Testing.** Drilling to detect the presence of, test, develop, produce, or inject geothermal resources can be done only on land covered by a geothermal resource lease.

A typical geothermal well drilling operation would require two to four acres for a well pad, including reserve pit, and  $\frac{1}{2}$  mile of moderate duty access road with a surface eighteen to twenty feet wide and totalling up to forty feet in width with ditches, cuts, and fills. Existing roads would be used whenever possible. Total surface disturbance for each well, and any new road is expected to be less than six acres. In some cases, more than one production well could be drilled from one pad. Well spacing would be determined by the authorized officer after considering topography, reservoir characteristics, optimum number of wells for proposed use, protection of correlative rights, potential for well interference, interference with the multiple uses of the land, and protection of the surface and subsurface environment. There would be close coordination with the State of Oregon. It is anticipated that the duration of well development, testing, and if dry, abandonment, would be four months.

**Plugging and Abandonment.** Prior to abandonment, the operator would be required to plug the hole to prevent contamination of aquifers and any effects to subsurface and surface resources. Plugging would be accomplished by placing cement plugs at strategic locations in the hole. Depending upon the formations encountered, drilling mud could be used as a spacer between plugs to prevent communication between fluid bearing zones. The drill casing would be cut off at least six feet below ground level and capped by welding a steel plate on the casing stub. After plugging, all equipment and debris would be removed, and the site restored as near as reasonably possible to its original condition. A dry hole marker is often placed at the surface to identify the well location. If the surface owner prefers, the marker may be buried. Any new roads not needed for other purposes, would be reclaimed. It is estimated that three exploratory wells would be drilled under all alternatives during the life of the plan.

**Geothermal Power Plant Development.** It is projected that one power plant generating 24 megawatts of electricity (gross), would be constructed within the Klamath Falls known geothermal resource area under all alternatives during the life of the plan. It is anticipated that the developed geothermal resource would be water-dominated and that the geothermal power conversion system would either be single or double flash, or binary cycle. Before geothermal development could occur, site-specific baseline studies and environmental analyses, with public involvement, would be done. The scenario below describes the level of disturbance that would likely occur from the development of a 24 megawatt power plant.

Five to seven production wells and one or two injection wells would be drilled. It is anticipated that access would be provided by existing roads, and the construction of short roads ( $\frac{1}{2}$  to 1 mile long) with a surface of 18 to 20 feet wide and totalling up to 40 feet in width with ditches, cuts, and fills. Surface disturbance from well pad and road construction would probably range from two to six acres per well. The power plant facility, including separators, energy converters, turbines, generators, condensers, cooling towers, and switchyard, would involve an estimated ten to fifteen acres. Pipelines and powerlines would disturb an additional three to six acres. If a water cooling system is employed, one to three water wells, requiring about  $\frac{1}{4}$  acre per well, would be drilled, unless the cooling water was obtained from the geothermal steam condensate. Depending upon the location, terrain, geothermal reservoir characteristics, and type of generating facility the total surface disturbance for a 24 megawatt (gross) geothermal power plant, and ancillary structures, would probably range from about 26 to 76 acres, or about 1 to 3 acres per megawatt. After construction, approximately  $\frac{1}{4}$  to  $\frac{1}{2}$  of the disturbed area would be revegetated. Prior to abandonment, the remaining disturbed area would be reclaimed.

**Direct Use of Geothermal Energy.** Low- and moderate-temperature (50 to 300 degrees Fahrenheit) geothermal resources have many direct applications. Direct applications, and potential development scenarios, include



space heating and cooling of residences and businesses, applications in agriculture, aquaculture, and industry; and recreational and therapeutic bathing. Depending upon the type of use and magnitude of operation, surface disturbance could range from a few acres for a well and greenhouses, or food processing facility, to tens of acres for larger agricultural or aquacultural developments. It is anticipated that during the life of the plan two wells would be drilled to support one geothermally-heated greenhouse operation within the Klamath Falls known geothermal resource area under all alternatives.

## **Locatable Mineral Resources**

### **Reasonably Foreseeable Development Scenarios (Common to All Alternatives)**

**Future Trends and Assumptions.** The major commodities of interest would continue to be the precious metals, gold and silver. This is based on a combination of price (especially for gold) and the favorable geology for mineral occurrences. Reclamation science would continue to advance due to experience and research. More detailed design effort would be placed on the reclamation of mined lands in the future. This would result in an overall increase in reclamation costs but those costs should pay dividends in the long term with increased reclamation success.

The economics of mining in the planning area would be driven by the relationship between production costs and the market price of the commodity. While production costs can be controlled, or anticipated through management and technology, the big unknown would be in the price of the mineral commodity, especially gold. The overall profitability of an operation, and hence the level of activity at the prospecting, exploration, and mining phases, for development of ore bodies would be closely related to the price of the mineral commodity.

No chemical heap leaching operations are anticipated during the life of the plan. If such an operation is proposed during the life of the plan, it will be subjected to environmental review under a plan of operations pursuant to regulations found in 43 Code of Federal Regulations 3809.

### **Background on the Development of a Locatable Minerals Mine**

The development of a mine from exploration to production can be divided into four stages. Each stage requires the application of more discriminating (and more expensive) techniques over a successively smaller land area to identify, develop, and produce an economic mineral deposit. The full sequence of developing a mineral project involves reconnaissance, prospecting, exploration, and mine development.

**Reconnaissance.** Reconnaissance level activity is the first stage in exploring for a mineral deposit. This activity involves an initial literature search for the area of interest, using available references, such as publications, reports, maps, and aerial photos. The area of study can vary from hundreds to thousands of square miles. Activity that would normally take place includes large scale mapping, regional geochemical and geophysical studies, and remote sensing with aerial photography or satellite imagery. These studies are usually undertaken by academic or government entities, or major corporations. The type of surface disturbing activity associated with reconnaissance level mineral inventory is usually no more than occasional stream sediment, soil, or rock sampling. Minor off-highway vehicle use could be required.

**Prospecting.** As the result of anomalous geochemical or geophysical readings, unique geologic structures or features, occurrence of typical mineral bearing formations, or a historical reference to past mineral occurrence, the prospecting area of interest is identified. This area could range from a single square mile to an entire mountain range of several hundred square miles.

Activity that would take place in an effort to locate a mineral prospect includes more detailed mapping, sampling, geochemical, and geophysical study programs. This is the time when property acquisition efforts usually begin and most mining claims are located in order to secure ground while trying to make a mineral discovery. Prospecting on an annual basis is considered a minimum requirement, under the mining laws, to secure a claim.

The types of surface disturbing activity associated with prospecting involve more intense soil and rock chip sampling, using mostly hand tools; frequent off-vehicle vehicle use; and placement and maintenance of mining claim monuments. This activity is normally considered *casual use* (43 Code of Federal Regulations 3809.1-2) and does not require BLM notification or approval.

**Exploration.** Upon location of a sufficiently anomalous mineral occurrence, or favorable occurrence indicator, a mineral prospect is established and is subjected to more intense evaluation through exploration techniques. Activities that take place during exploration include those used during prospecting, but at a more intense level and in a smaller area. In addition, activities, such as road building, trenching, and drilling, are conducted. In the later stages of exploration, an exploratory adit or shaft may be driven. If the prospect already has underground workings these may be sampled, drilled, or extended. Exploration activities use mechanized earth moving equipment, drill rigs, etc., and may involve the use of explosives.

Typical exploration projects in the planning area could include: in-stream dredging with portable suction dredges; exploratory drilling, which could include construction of new roads; use of explosives to sample rock outcroppings; and excavation of test pits. If the exploration project disturbs five acres or less, it is conducted under a *notice* (43 Code of Federal Regulations 3809.1-3) which requires the operator to notify BLM fifteen days before beginning the activity. A copy of each notice received is sent to the Oregon Department of Geology and Mineral Industries for their review. If the project disturbs more than five acres, it is conducted under a plan of operations (43 Code of Federal Regulations 3809.1-4) and requires National Environmental Policy Act compliance before approval.

**Mine Development.** If exploration results show that an economically viable mineral deposit is present, activity would intensify to obtain detailed knowledge regarding reserves, possible mining methods, and mineral processing requirements. This would involve applying all the previously used exploration tools in a more intense effort. Once enough information is acquired, a feasibility study would be made to decide whether or not to proceed with mine development and what mining and ore processing methods would be used.

Once the decision to develop the property is made, the mine permitting process begins. Upon approval, work begins on development of the mine infrastructure. This includes construction of the mill, offices, and laboratory; driving development workings if the property is to be underground mined, or prestripping if it is to be open pit mined; building access roads or hauling routes; and placement of utility services. During this time additional refinement of the ore reserves is made.

Once enough facilities are in place, actual mine production begins. Concurrent with production there are often satellite exploration efforts to expand the mine's reserve base and extend the project life. Reclamation of the property is conducted concurrently with, or upon completion of, the mining operation. Often uneconomic resources remain unmined and the property dormant until changes in commodity price or production technology makes these resources economically feasible to mine.

Activities that occur on these lands include: actual mining, ore processing, tailing disposal, waste rock placement, solution processing, metal refining, and placement of support facilities, such as repair shops, labs, and offices. Such activities involve the use of heavy earthmoving equipment and explosives for mining and materials handling, exploration equipment for refinement of the ore reserve base, hazardous or dangerous reagents for processing requirements, and general construction activities.

The size of mines varies greatly and not all mines would require all the previously mentioned facilities and equipment. Acreage involved can range from several acres to several hundred, with most projects disturbing five acres or less and requiring a notice pursuant to 43 Code of Federal Regulations 3809.1-3. Projects disturbing more than five acres require an approved plan of operations pursuant to 43 Code of Federal Regulations 3809.1-4.

## Reasonably Foreseeable Development

Based on the mineral exploration activity of the last planning period, and recent discoveries of Tertiary epithermal disseminated gold deposits, it is anticipated that four notices for disseminated gold exploration would be submitted under all alternatives during the life of the plan. It is predicted that approximately ten holes would be drilled



## *Appendix N - Mineral and Non-Mineral Development Scenarios*

using truck mounted drill rigs for each notice. Drill sites would disturb less than 1/10 of an acre. Temporary access roads, ten to twelve feet wide, would be constructed for about one-third of the drill holes, but in most cases the existing roads would be used. Drill holes would be plugged in accordance with state and federal regulations, and reclamation, including rehabilitation of drill pads and access roads, would be conducted at the conclusion of the exploration program.

In addition to the gold exploration mentioned above, It is anticipated that two notices for in-stream suction dredging would be filed under all of the alternatives. In-stream dredging is usually a one or two person operation using a floating suction dredge with a five to seven horsepower engine. The dredge pulls up all the gravel in the stream down to bedrock. The gravels are passed over a sluice box and are returned to the stream without the gold. This process does not require any chemicals. Most of the dredges have an intake nozzle opening less than five inches in diameter. Other activities associated with dredging include temporary occupancy and minor road and trail construction. These operations will be monitored pursuant to the regulations found in 43 Code of Federal Regulations 3809.1-3.

## **Salable Mineral Resources**

### **Reasonably Foreseeable Development Scenarios**

**Future Trends and Assumptions.** The major use of salable minerals (primarily rock and cinders) would continue to support the timber program. Because major haul roads are already constructed and in good condition, it is expected that the demand for rock and cinders would not vary significantly between the alternatives. It is anticipated that rock and cinders would be needed in about the same quantities as in the past for maintenance and construction of county and state roads and highways. Public demand would probably remain minimal for these salable minerals, with a slight increase in demand for decorative rock (in all the alternatives).

Existing quarries and pits would most likely be used for obtaining the cinder and rock, but new site development is not precluded by this plan.

### **Projected Quarry and Cinder Development Scenario (Common to All Alternatives)**

Existing and new quarry and cinder sites, on the average, disturb approximately two or three acres of land. This acreage is necessary for the mine itself, rock crushing operations, truck turn-around areas, access trails for bulldozers and drills, overburden stockpile sites, and aggregate stockpile areas. For access to a new quarry site, approximately 1/2 acre of land would be disturbed by new road construction, most often affiliated with a timber sale contract. Upon depletion, reclamation work would be conducted on the material sites as well as all unneeded access roads and trails.

It is expected that the eighteen existing quarry and cinder sites in the planning area would be used intermittently throughout the life of the plan, and that one or two new sites would be opened up. Any existing pit expansion that causes surface disturbance beyond previously inventoried limits, or the development of any new site, would require resource inventories, site-specific National Environmental Policy Act analyses, and development and reclamation plans.

It is expected that up to four depleted quarries would be reclaimed in conjunction with timber sales during the life of the plan. After all useable material is removed, reclamation work would be conducted according to an approved interdisciplinary plan.

### **Projected Decorative Stone Site Development Scenario (Common to All Alternatives)**

It is anticipated that the Lakeview District Office would receive one or two sale requests per year for decorative stone. In most cases, existing roads would provide access to areas where the stone is scattered on the surface.

In these areas, the rock would be hand-picked and loaded directly onto pickup or flatbed trucks, or onto pallets and then loaded onto trucks. There would be both on- and off-highway vehicle travel. There is a possibility that temporary road or trail construction could be necessary to gain access to some areas, such as the rocky area of the Gerber Block. Prior to designating an area as a decorative rock gathering area, and prior to any road or trail construction, appropriate inventories and National Environmental Policy Act analyses would be conducted to prevent unnecessary and undue degradation. Reclamation plans would be developed for any designated collecting areas and their access roads and trails.

## **Alternative Non-Mineral Energy Development Scenarios**

All non-mineral energy project proposals are considered tentative or speculative and do not warrant detailed consideration in this Resource Management Plan/Environmental Impact Statement. No BLM permits, leases, agreements, or rights-of-way, would result from this plan, with the exception of the Salt Caves hydroelectric project proposal under Alternatives A and B. Any potential BLM decision for areal or linear rights-of-way or non-mineral energy development would be guided by applicable laws, regulations, and procedures and include appropriate environmental analyses. Any application would first be screened for general consistency with the approved plan. Proposals that are clearly prohibited by resource management plan land use allocation decisions would be rejected without further consideration. Applications that could be permitted or conditionally permitted could be analyzed on a case-by-case basis. Such analysis could include potential resource management plan amendments, if warranted. Plan amendments would involve substantial public notice and involvement opportunities, incorporate appropriate levels of environmental analysis, and require interagency coordination.

## **Solar and Wind Generated Energy Development**

Currently there are no proposals for wind or direct solar energy conversion sites. Bureau of Land Management lands in the planning area are not expected to provide any opportunities for wind or direct solar energy generation due to the lack of suitable wind velocity and reliability and the lack of sufficient sunny days per year.

## **Pumped Storage Hydroelectric Project Rights-of-Way**

There are no operating pumped storage facilities in Klamath County. According to the waterpower site records maintained by the BLM Oregon State Office, since January 1987, there have been fifteen preliminary permit applications made to the Federal Energy Regulatory Commission for pumped storage projects in the Klamath Falls Resource Area. All of the applications have been filed by two competing developers at eight different potential pumped storage sites; seven of the sites are on Bryant Mountain, with the eighth site on Stukel Mountain. Ten of the fifteen preliminary applications covering six of the locations are still active. A preliminary permit to conduct feasibility studies has been issued to the Russel Canyon Corporation for the Stukel Mountain Pumped Storage Hydroelectric Project and the Lorella Pumped Storage Project.

The BLM and the Federal Energy Regulatory Commission are cooperating on the preparation of an environmental impact statement that is being prepared for the Lorella Pumped Storage Project. The decision to issue a right-of-way to authorize use of BLM-administered public land for the Lorella Pumped Storage Project will be made from information developed during the environmental impact statement process.

The general arrangement of a pumped storage project includes an upper reservoir formed by one or more, usually two, embankments and a lower reservoir usually formed by one continuous embankment. The two reservoirs are connected by a power tunnel with a powerhouse located near the lower end of the power tunnel.

The size of the upper and lower reservoirs generally allow for approximately 10 hours of generation at the rated capacity of the project. This represents a storage capacity between 12,000 and 16,000 acre feet of water for a 1,000 Megawatt plant operating at maximum generating capacity. Between 500 and 1,000 acre feet of makeup water would be needed annually to replace losses incurred from seepage and evaporation. The project is a

closed system with water cycling between the upper and lower reservoirs. The cycle between empty and full would probably be every 48 hours, although cycling every 24 hours is possible. Resources found on the lands inundated by project waters would essentially be eliminated by the project, and little, if any, resource value would accrue from the artificially created wetlands due to the frequency of water fluctuation.

Pumped storage projects recycle water within a closed system to provide a source of quick start peak power and to level-out the demand on thermal units, run of river hydroelectric plants, and other sources of baseload power. During off-peak periods, when demand for electrical power is low, the reversible pump/turbines would operate in a pumping mode, pumping water from the lower reservoir to store in the upper reservoir. Energy for pumping would be provided from thermal, nuclear, or run-of-river hydroelectric plants. During periods of higher electrical demand, water would flow from the upper reservoir through the reversible pump/turbines to the lower reservoir to generate on-peak energy.

Pumped storage hydroelectric projects consume more electrical energy than they produce, operating at approximately 80 percent efficiency (for every 100 kilowatts of pumping energy 80 kilowatts of peak power is produced). They could be profitable when they can be located near a suitable electrical supply/distribution network and the peak electrical sales price sufficiently exceeds the night time purchase price.

Pumped storage projects can be environmentally benign when they are powered during the off-peak times by nuclear or gas fired plants, and they replace coal or oil fired powerplants used to meet peak demand. The benefits derived from pumped storage plants are substantially lower when off-peak power is provided by run-of-river hydroelectric plants and anadromous fish are affected as a result.

Effects resulting from the operation of the proposed project are not under the purview of the BLM, but are the responsibility of the Federal Energy Regulatory Commission.

## Salt Caves Hydroelectric Project

The potential economic benefits and the project-specific and cumulative environmental effects associated with four alternatives, including the Alternative No Action, for developing the hydroelectric resource of the upper Klamath River in Southern Oregon were evaluated by the Federal Energy Regulatory Commission in their *Final Environmental Impact Statement on the Salt Caves Hydroelectric Project* (Federal Energy Regulatory Commission 1990) and which is incorporated by reference into this Environmental Impact Statement. The Federal Energy Regulatory Commission recommended the no-dam alternative for licensing because it would be the least environmentally damaging method to develop the hydroelectric resource of the Klamath River; therefore only the no-dam alternative is discussed here.

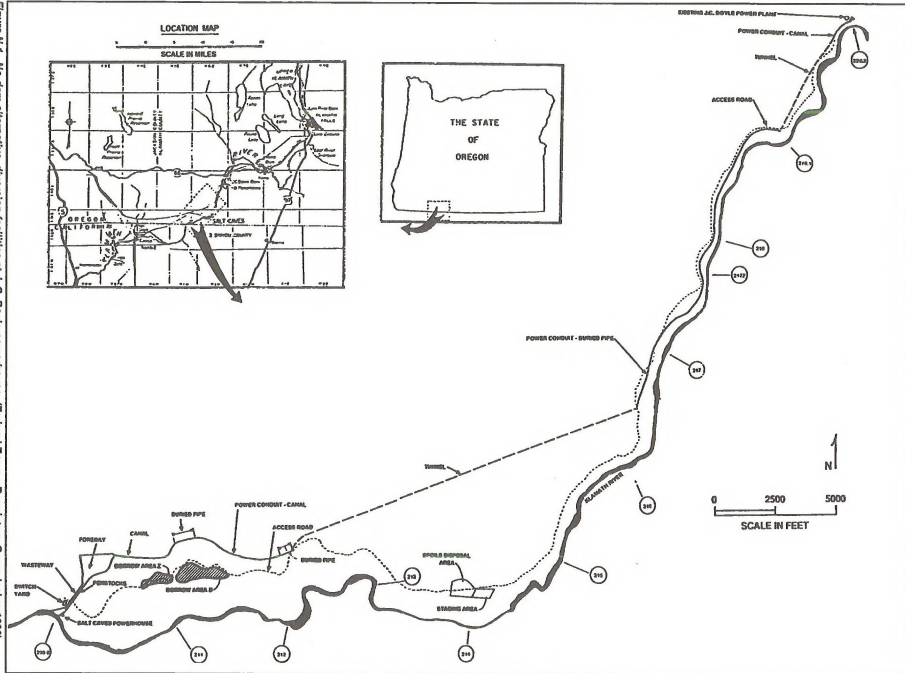
The City of Klamath Falls has resubmitted its water quality application to the Oregon Department of Environmental Quality for a new Salt Caves proposal. Due to the late date of the City's resubmitted proposal during this Resource Management Plan/Environmental Impact Statement's preparation and printing process an evaluation of the new proposal was not possible at this time. A thorough evaluation of the new proposal will occur at a later date.

**Proposed Action.** The no-dam alternative would consist of a diversion facility at the tailrace of the existing J.C. Boyle Hydroelectric Project powerhouse (Figure N-1) 20,850 ft. of concrete-lined, unpressurized 21-foot-diameter tunnel in two segments; 15,300 feet of buried pipe located in two segments; 6,020 feet of open canal; a 1,900-foot-long channelled forebay leading to twin, steel 10-foot-diameter penstocks 1,630 feet long; a powerhouse containing two 48-megawatt turbine generator units; and a 7,500-foot-long, double circuit 230-kilovolt transmission line (Figure N-2).

The power conduit, would extend 9.7 miles upstream from the forebay to the tail race of the John C. Boyle Hydroelectric powerhouse, and would be located at an elevation of approximately 3,330.0 feet. The powerhouse would be located at river mile 209.9 near the Oregon-California border.

An existing unimproved road would be upgraded from the J.C. Boyle powerhouse downstream to the vicinity of the proposed Salt Caves powerhouse to serve as the project's main access road. Additionally, a service road would be constructed adjacent to the power canal and forebay for use solely by plant personnel.

Figure N-1. No-dam alternative, diversion facilities at J. C. Boyle powerhouse. (Federal Energy Regulatory Commission 1990)



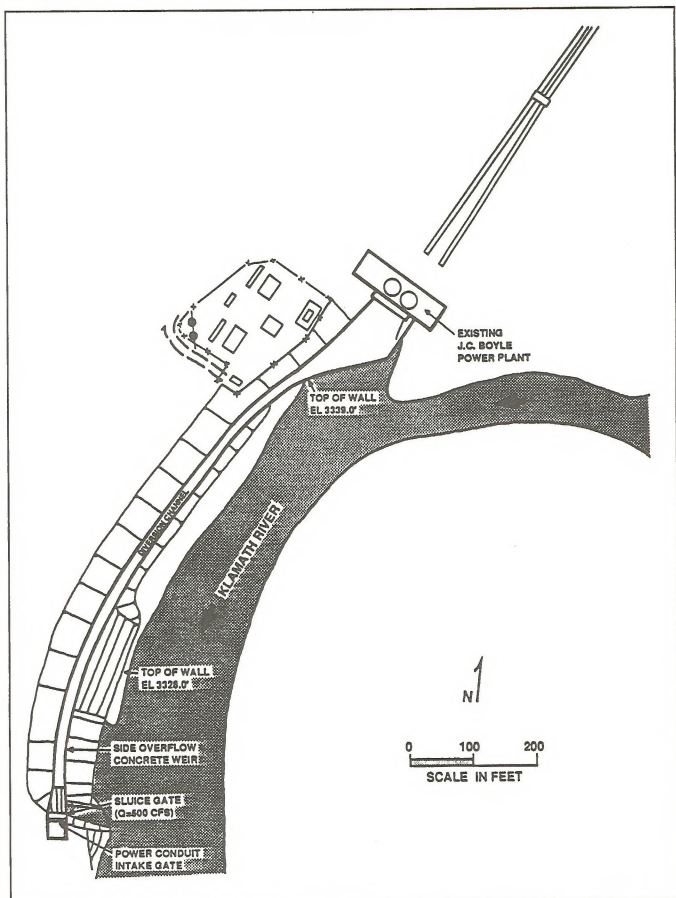


Figure N-2. No-dam alternative general plan. (Federal Energy Regulatory Commission 1990)



Various features would be included in the no-dam alternative to mitigate adverse effects on fish, wildlife, and recreation. These include wildlife crossings and escapes along the power canal and a side overflow concrete weir at the diversion facility capable of releasing flows for whitewater rafting (Figure N-1).

To reduce visual and wildlife effects, approximately 80 percent of the 8.4-mile power conduit would consist of either tunnel or buried pipe. To facilitate wildlife crossing of the remaining twenty percent, five wildlife overpasses would be located along the exposed canal portion of the conduit. An eight-foot-high fence would extend the length of the canal and forebay to prevent wildlife entry, and escape ramps would be provided along the canal.

The other mitigative measures proposed by the applicant and supplemented by the Federal Energy Regulatory Commission staff for the proposed project would be incorporated, where applicable, into the no-dam alternative (Table N-1).

**Operation.** Since the no-dam alternative diversion facilities would only be capable of using tailrace discharges emanating from the J.C. Boyle powerhouse, the no-dam alternative's power generation would be completely dependent upon the volume and duration of discharges from the upstream project. The Salt Caves no-dam alternative would have to mimic the generating mode of the J.C. Boyle Project.

With the exception of occasional releases for rafting, no water would be released into the river at the diversion site to supplement the existing instream flows (ranging from about 350 to 400 cubic feet per second). The no-dam alternative would annually generate an average of 432 gigawatt hours. The 17 percent increase in generation over the applicant's proposal is due to the gain in head associated with moving the diversion site upstream to the J.C. Boyle powerhouse.

A total of 1,500 cubic feet per second would be provided to facilitate whitewater boating for six hours per day for 32 days from mid-June through mid-August. The whitewater releases would be made at the diversion intake, immediately downstream of the J.C. Boyle powerhouse.

**Construction Plan and Schedule.** The main construction yard and staging area would be located on the right side of the river near river mile 214.3 (Figure N-2). With the elimination of the dam, material requirements would be greatly reduced, thereby eliminating the need for the principal borrow sites, areas J and L.

For the purposes of earthwork during construction, the project would be divided into two sections. The upstream portion of the project would include all facilities upstream of the inlet portal of the long tunnel. Earthwork in the upstream portion would result in approximately 1.2 million cubic yards of excess excavation, which would be placed in a spoils disposal area of about 21 acres immediately adjacent to the staging area (Figure N-2). The downstream portion of the project begins with the long tunnel and includes all facilities downstream. Cuts and fills for the downstream portion would be balanced, with the forebay embankments absorbing the majority of materials excavated. Impervious material for the core of the embankments and for the forebay lining would be excavated from borrow area D while area Z would serve as an additional materials source (Figure N-2). The no-dam alternative would be constructed over a 33-month period.

**Work Force Requirements.** The construction work force for the no-dam alternative would peak at about 540 workers, with total construction effort estimated at 1,218,000 manhours. Employment associated with ongoing operation and routine maintenance would be limited to one or two workers.

**Safety Controls.** Security features would be provided as protection from vandalism and also to protect the public and wildlife from high voltage electrical equipment. The powerhouse top deck would be constructed of reinforced concrete, and backfilled flush with the ground. Equipment access hatches would be of concrete or steel to prevent removal without proper equipment. Personnel access would be by means of a padlocked Bilco-type bulkhead in the deck. The substation beside the powerhouse and the switchyard would be fenced with padlocked entry gates. The powerhouse access roads from both the south and north and the power conduit maintenance road would be fenced and gated where they intersect public access roads. All operating and control equipment for such items as gates and measuring equipment would be provided with appropriate protective housings. The fish screenhouse would be enclosed with locked access doors.



**Table N-1. Mitigative Measures for the No-Dam Alternative.**

Affected Resource	Proposed Measures
Geology and Soils	<p>Reclamation and revegetation of borrow areas, staging areas, and cut-and-fill slopes.</p> <p>Avoidance of landslide hazard areas and monitoring of potential landslide hazards with inclinometers and piezometers.</p> <p>Erosion and sediment control program.</p>
Fish and Aquatic Habitat	<p>Habitat improvements in Spencer Creek and the diversion reach.</p> <p>Downramping of Salt Caves powerhouse discharge flows over 5.5 hours. Ramping of rafting releases as per existing releases at the Boyle powerhouse.</p> <p>Maintenance of existing daily timing of downramping in the powerhouse reach to protect larval endangered suckers during the larval drift period in spring.</p> <p>Monitoring of fish attraction to the powerhouse tailrace and provisions to alleviate potential injury to the fish or migration delays associated with the attraction.</p> <p>Fish population and mitigation effectiveness monitoring program.</p> <p>Construction of the powerhouse cofferdam during the low-flow summer period to minimize sediment input to the river.</p> <p>Financial support of the endangered sucker restoration efforts of the Interagency Klamath Basin Suckers Working Group.</p> <p>Winter-spring flushing flows of 1,500 cubic feet per second during dry years, released at J.C. Boyle powerhouse over a period of several days.</p>
Wildlife and Botanical Resources	<p>Wildlife habitat management of 2,066 acres, including fencing to exclude livestock, and vegetation manipulation on 495 acres. Creation of 18 wetlands (1/2 acre each) along canal. Enhancement of five wetlands at existing seeps using check dams.</p> <p>Burial and tunneling of 36,150 feet of power conduit.</p> <p>Deer fencing (8 feet high), escape ramps (3), and 100-foot-wide wildlife overpasses (4) along the 6,020 feet of open canal and along the forebay.</p> <p>Three wildlife crossings over penstock and wasteway.</p> <p>Construction disturbance avoidance plan to minimize disturbance to nesting raptors and wintering deer by restricting construction timing and location.</p> <p>Camping and off-highway vehicle use restrictions in specific areas along the river with signs of excessive soil compaction and vegetation disturbance from these activities.</p> <p>Closing of access roads into the lower reach of the canyon (especially south-facing slopes) by gating in winter to minimize disturbances to wintering deer.</p> <p>Provision of nest platforms for osprey.</p>

**Table N-1. Mitigative Measures for the No-Dam Alternative (cont).**

Affected Resource	Proposed Measures
	<p>Design of transmission lines to avoid raptor electrocution.</p> <p>Construction crew education program to minimize wildlife disturbance and encourage compliance with speeding restrictions on access roads.</p> <p>Wildlife monitoring program and contingency plan including raptor nest site surveys, winter raptor surveys, and raptor nest monitoring.</p> <p>Deletion of the applicant's proposed powerhouse bridge.</p> <p>Preconstruction site-specific reclamation and revegetation plan, including monitoring and contingency plans.</p> <p>Fire prevention and control plan to minimize risk to wildlife during construction and operation.</p>
Land Use	Range improvement measures on the Edge Creek allotment.
Recreation	<p>Scheduled whitewater rafting release flows on 32 days for 6 hours per day at 1,500 cubic feet per second. Releases between June 15 and the end of the third week in August to lessen effects to juvenile trout. Release scheduling to be done in consultation with the BLM. Public notification of the schedule.</p> <p>Improvement of existing roads in the project area and construction of new roads to provide better access for recreationists.</p> <p>Provision for construction of four new, primitive recreation areas, including an unsurfaced foot trail for fishing access.</p> <p>Recreation facilities to be installed on a schedule developed in consultation with the BLM on the basis of an applicant-sponsored recreation use monitoring program.</p> <p>Off-site improvements to the county-operated Sportsman Park.</p> <p>Several asphalt pads to provide fishing and viewing access for the handicapped.</p>
Visual Resources	<p>Recontouring of cut and fill slopes and borrow areas to natural-appearing and stable slopes.</p> <p>Development of blasting schemes that result in natural-appearing rock formations and enhance revegetation opportunities.</p> <p>Setting back clearing, grading, and construction activities at borrow areas, conduit fill slopes, and recreation facilities 100 feet from the shoreline.</p> <p>Development of vegetation planting and management specifications for road-sides, transmission line rights-of-way, conduit rights-of-ways, and all facilities.</p> <p>Feathering of transmission line rights-of-way clearings, and use of wood poles and nonreflective equipment, structures, and hardware.</p>

**Table N-1. Mitigative Measures for the No-Dam Alternative (cont).**

Affected Resource	Proposed Measures
Visual Resources (continued)	<p>Protection of horizon line by setting back from rim borrow area D, recreation parking areas C and D, and construction activities where possible.</p> <p>Diminishing visual contrast of specific project features using dark, recessive matte tints or paints and concrete forms with rough textures and shadow patterns that match surrounding dominant landscape.</p> <p>Siting and designing tunnel portals to reduce visual contrast with the surrounding landscape.</p> <p>Use of topographic features to help screen the switchyard and substation from the river and roads.</p> <p>Siting and designing of wildlife and livestock fencing to be unobtrusive along the river and roads.</p> <p>Re-contouring and revegetation of tunnel spoils.</p> <p>Burial of approximately thirty percent of the penstock and painting of the above-ground sections with dark, recessive matte colors.</p> <p>Provision of only safety and emergency outdoor lighting to protect nighttime darkness.</p> <p>Partial protection of the visual quality of the sightseeing and rafting experience by burying and tunneling eighty percent of the power conduit.</p>
Socioeconomics	<p>Monitoring construction employment on a monthly basis and advising any affected agencies of potential growth problems.</p> <p>Requiring construction contractors to hire local labor when possible and instituting on-the-job training when practicable to maximize the level of local employment.</p> <p>Maintaining and upgrading the J.C. Boyle access road section affected by construction and developing maintaining all project access roads to meet county roadway improvement standards.</p>
Cultural/Historical Resources	<p>Scientific excavation to recover data at the Border Village site (KLA-16).</p> <p>Execution of site location confidentiality agreements with construction supervisory personnel to protect sites from vandalism.</p> <p>Continued monitoring of prehistoric sites by the BLM and project maintenance personnel to determine whether indirect effects are occurring.</p> <p>Location of recreation area A 1,500 feet upstream to avoid direct and indirect effects on prehistoric archaeological sites (KLA-20, -21, and -554).</p> <p>Location of boat launch area upstream to avoid indirect effects on prehistoric archaeological site (KLA-21).</p>

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**Table N-1. Mitigative Measures for the No-Dam Alternative (cont).**

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**Affected Resource****Proposed Measures**

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Temporary fencing only for archaeological sites within 500 feet of construction areas to avoid revealing the site locations. Monitoring during construction for sites located within 500 feet of construction areas.

<sup>1</sup>Source: the Federal Energy Regulatory Commission.

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A diesel-driven generator would be provided in the powerplant to supply station service power under emergency conditions. In operating the proposed rafting release chute, a system would be provided to warn any fishermen prior to beginning the release. The release would be increased gradually from zero to the maximum and then decreased gradually.

## **Environmental Effects of the Salt Caves Project**

The discussion of environmental effects is extracted from the Federal Energy Regulatory Commission's Final Environmental Impact Statement on the Salt Caves Project and is intended to provide a representative sample of the environmental effects of the Salt Caves project. Refer to Federal Energy Regulatory Commission/Environmental Impact Statement for a more complete description of effects and mitigating measures.

The primary effects on geology and soils would be increased short- and long-term erosion and sedimentation from surface-disturbing activities, along with potential hazards of natural mass-wasting processes in portions of the project area.

Construction of the power conduit would result in 21,650 feet of cut and fill slopes. Although the steepest section below the J. C. Boyle powerhouse would be tunneled, the remaining upriver segment would result in nearly continuous cut slopes and localized large fills roughly at river mile 216.5 and river mile 219.0. Disposal of 1.2 million cubic yards of excess excavation material in a 21-acre spoil disposal area adjacent to the staging area would occur. The buried pipeline would cross six talus slopes of considerable size at the following river miles; 213.2, 215.4, 216.0, 212.8, 214.6, 219.0, and 217.8. Relocation of the canal and forebay upslope would result in its intersecting portions of several rotational-slide blocks. None of the landslides are moving at present, but the possibility exists for remobilization through undercutting the landslide. The power conduit would be susceptible to effects if landslides, rockfalls, or debris flows were to occur. The 19-acre earthlined forebay would be more prone (depending upon lining material used) to water seepage into the underlying rock, thereby potentially reducing slope stability in the immediate area. Sediment input to the river from road construction and use during rainfall events would be high even with mitigative measures. Construction of borrow areas D, Z, and T would create high erosion rates in the borrow areas due to increased runoff volumes and redirected and concentrated flows. Proposed mitigation measures would be less effective if expected revegetation does not occur. Very slow revegetation of cuts along the existing road, accompanied by sloughing, indicate that the expected revegetation rate may not be attained.

The no-dam alternative would modify the existing flow regime of the Klamath River by diverting, up to 2,400 cubic feet per second of J.C. Boyle powerhouse discharges at river mile 220 and returning the water to the river at river mile 210. The remaining flow of 350 to 400 cubic feet per second in the diversion reach would be made up of the required 100 cubic feet per second minimum instream flow from the J. C. Boyle dam and 250 to 300 cubic feet per second of high quality spring water entering the diversion reach. Maximum water temperature would be reduced relative to existing conditions in the project reach between the J.C. Boyle and Salt Caves

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powerhouse. Between the Salt Caves powerhouse and Copco reservoir, the water temperature regime would be similar to existing conditions (the State of Oregon and the Federal Energy Regulatory Commission staff disagree on water temperature effects). Refer to the Federal Energy Regulatory Commission Environmental Impact Statement for more detail.

Benthic algae and macrophyte production in the diversion reach would increase over existing conditions due to stabilized lower flows, lower velocity, and high solar radiation (shallower, clearer water); however, total production would not reach levels sufficient to suppress dissolved oxygen below the state standard of 7 milligrams per liter during the summer. Lower levels of nutrients (especially phosphorous), lower water temperatures, winter spillage at Boyle Dam, and summer rafting releases would ensure against development of a high biomass of plants in the diversion reach.

Dissolved oxygen levels are not expected to decline below existing levels in the diversion reach under the no-dam alternative.

In the power house reach dissolved oxygen levels would be similar to existing and proposed project conditions, with the exception that the shift in peak water temperatures from night to daylight hours would increase nighttime (minimum) dissolved oxygen concentrations.

The upper Klamath River fishery resources, particularly the wild rainbow trout population in the project reach, would benefit from the no-dam alternative compared to existing or proposed project conditions.

Suspended sediment would be input to the river during construction and would potentially reduce the survival of rainbow trout and endangered sucker eggs spawned in the diversion and powerhouse reaches.

In the long term, the no-dam alternative would result in improved growth, survival, and recruitment of the rainbow trout population in the project reach over existing or proposed project conditions because of improvements to habitat and reductions in standing of trout fry and juveniles.

Overall, the shortnose and Lost River suckers would be minimally affected by the proposed no-dam alternative. The transfer of the release of J. C. Boyle Reservoir water from the J. C. Boyle Powerhouse to the Salt Caves powerhouse would not change existing adverse conditions in the sucker spawning area above Copco Reservoir. Ramping rates below the Salt Caves powerhouse would be unchanged; however, the change in the time of occurrence could increase the degree of fry standing.

Enhancement to the habitat in the Salt Caves diversion reach under the no-dam alternative could increase the amount of spawning habitat for Copco Reservoir suckers. Gravel introduction to the diversion reach would also increase sucker spawning habitat. Stable flows in the diversion reach would benefit sucker egg and fry survival.

Although the potential standing of sucker eggs and fry in the diversion reach would be reduced from existing conditions, standing would remain a problem in the major spawning areas above Copco Reservoir. While there is the potential of stabilizing flows below the Salt Caves powerhouse during the spring under the applicant's proposal using water stored in the proposed Salt Caves reservoir, this would not be possible under the no-dam alternative without a change in the operating regime of the J. C. Boyle Project.

Approximately 88 vegetated acres would be permanently lost due to replacement by above-ground project features. Vegetation removal would occur on approximately 148 additional acres that would be revegetated following construction.

A permanent acreage in the 5,675 acre no-dam alternative project area loss would include about 3 percent of the meadow community type, 4 percent of the oak/shrub type, 2 percent of the mixed conifer type, and lesser percentages of the other types. The 148 acres lost temporarily during construction would include 5 percent of the meadow type, 5 percent of the pine/oak forest type, and 5 percent of the pine/juniper type within the terrestrial study area. Although revegetation would occur following construction on this latter area, conifer forests would require longer than the 50-year license period in most cases to regain their current stage of development. The combined long-term loss of conifer forest types within the terrestrial study area would be about 3 percent for mixed conifer type and 6 percent for pine/oak type.



The total area of wildlife habitat lost or modified by the no-dam alternative would be about 237 acres. This includes about 88 acres that would be permanently lost. About 148 acres would be cleared and revegetated following construction.

The applicant proposes a habitat management program for 2,066 acres adjacent to the project as mitigation. Construction of the no-dam alternative would not result in the direct elimination of any known raptor nest sites, except for the possible elimination of an American kestrel nest site located near the proposed diversion structure. Habitat effects on forest raptors would occur from effects on 140 acres of forested habitat; however, this loss would not be mitigated during the license period because of the long recovery time for forested habitats.

Construction of the no-dam alternative would eliminate or modify 58 acres within bald eagle nesting territory. This represents 2 percent of the 2,740-acre territory. The long-term loss of 16 acres represents less than 1 percent of the territory area. No riverine or riparian habitat would be lost as a result of project development. The long-term loss of 16 acres would occur as a result of road and recreation facility development and in nonreclaimable fill areas.

Stabilized flows in the diversion reach are expected to improve foraging conditions for bald eagles.

Construction timing would reduce the potential for construction disturbance effects to a low level. Refer to the Federal Energy Regulatory Commission Environmental Impact Statement for more information.

Habitat effects on peregrine falcons would not occur if peregrines do not use the project area for nesting or wintering. If historic nest sites are re-occupied in the future, habitat effects would not be significant. Refer to the Federal Energy Regulatory Commission Environmental Impact Statement for more information.

One osprey nest site could be unusable for one to three nesting seasons due to construction disturbance. Increased recreational use associated with improved access to the west side of the river and operational and maintenance activities could adversely affect one osprey and one prairie falcon nest site and generally increase the level of wildlife disturbance on the west side of the river.

Surface-disturbing activities associated with construction of the Salt Caves penstock and powerhouse and recreation area E would adversely affect KLA-16, a prehistoric archaeological site that has been determined eligible for nomination to the National Register of Historic Places. Excavation for powerhouse foundations and wasteway would directly affect much of this site.

The applicant proposes to mitigate these adverse effects by completing a program of scientific excavation to recover data. Native Americans of the Shasta Nation have agreed to participate in the data recovery effort, as long as human burials and the artifacts accompanying the burials are handled in accordance with the tribe's wishes.

The no-dam alternative conduit would be located in proximity to several prehistoric archaeological sites including KLA-25, -628, -783, -790, and the forebay site. The Federal Energy Regulatory Commission staff concludes that effects on these sites during construction could be avoided by fencing or flagging the sites, instructing construction personnel to avoid them, and monitoring construction in their vicinity.

The no-dam alternative would have minor effects on land uses, including grazing, recreation uses, and potential future timber management. The no-dam alternative would also affect the suitability of the Klamath River Canyon for potential area of critical environmental concern designations. Licensing of the no-dam alternative would preclude future designation of the upper Klamath as a Wild and Scenic River.

Recreation uses would be both positive and negatively affected by the no-dam alternative. The no-dam alternative would reduce the values of the river that make it potentially eligible for area of critical environmental concern and Wild and Scenic River designations. This would be primarily attributable to the great reduction in flows in the diversion reach and the presence of man-made structures. The reduction in flows would benefit angling, but would reduce the value to whitewater boaters and other shoreline users, such as picnickers, campers, and wildlife observers. These reductions in value would affect the overall suitability of the river for area of critical



## *Appendix N - Mineral and Non-Mineral Development Scenarios*

environmental concern designation and eligibility for Wild and Scenic River designation. The no-dam alternative would not reduce the river's suitability and eligibility as much as would the applicant's proposal, regardless of staff-recommended mitigation.

Under the no-dam alternative, whitewater boating would be moderately adversely affected. A rafting release flow would be provided at the diversion facility discharge weir located about 950 feet downstream of the J. C. Boyle powerhouse. With 32 days of scheduled, predictable releases at this location, rafters could experience the same river conditions (length, flows, and use patterns) as they do under existing conditions. The major difference between the no-dam alternative and existing conditions would be the reduction in number of raftable days from June through September from approximately 87 days to 32.

The no-dam alternative would result in an improvement in the wild trout population compared to existing conditions and would thus enhance angling use. While improved access would provide an amount of increased angling opportunity similar to the applicant's proposal, the overall effect of an enhanced fishery would result in a higher angler success rate and overall higher-quality angling experience. Rafting releases in early and mid-summer would reduce some of the angling benefits of the no-dam alternative; however, a substantial improvement would occur over existing conditions.

The no-dam alternative would bury or tunnel approximately 80 percent of the power conduit system. The tunnel from river mile 220.0 to 219.1 and from river mile 216.7 to 212.0 would not be visible from the river or access roads. The tunnel portals would be designed to reduce visual contrast with the surrounding landscape.

In the short term, the buried conduit route would be highly visible from river mile 219.2 to 216.7 from the river and road due to the extensive cut and fill slope disturbance. The route would have low to moderate adverse aesthetic effects in the long term, provided the new fill slopes and cut banks remain stable and the revegetation of indigenous plants is successful. The buried conduit, totaling 15,300 feet in length, would require greater cutting and filling than the above-ground canal. The bench created on top of the buried conduit would permanently contrast with adjacent natural landforms and vegetation. In most locations, views from the road to the river would be across the buried conduit's bench and fill slope.

The above-ground power conduit beginning at river mile 212 would not be visible from the river but would be partially visible in the foreground from the nearby road and partially visible in the middle ground from the historic Topsy Grade. With the staff's recommended mitigation measures, including color and texture mitigation of the conduit surfaces, protection of roadside vegetation buffers, and successful establishment of indigenous vegetation in disturbed areas, the above-ground conduit would moderately affect canyon aesthetics.

Construction employment for the no-dam alternative would peak at 539 workers. Of this peak work force, 40 percent, or 220 workers, would be hired nonlocally. The population increase associated with this employment level would result in slightly less than a 1 percent increase, or 395 persons.

Construction wages and local expenditures could be as high as \$37.5 million, or \$12.5 million annually. Approximately 1/3 of the wages and expenditures would be taxes paid to the federal government and to the State of Oregon. Benefits from these dollars would not accrue locally.

Housing and public services would be relatively unaffected under this alternative, and income tax revenues to the state would remain at about \$1 million. Peak work force traffic demands on U.S. Highways 97 and Oregon Highway 66 would increase by 360 vehicles per day going to and from the site, which is not considered significant given directional considerations.

During operation, the net revenues under this alternative could be as high as \$6.8 million annually until all debt is retired and \$29.8 million thereafter. Revenue would be approximately equal to that associated with the applicant's proposal. The property tax offset would represent a tax savings of approximately 12 percent to city residents.

Whitewater boating use under this alternative could reasonably reach existing levels of 3,000 users, which would mean no loss in income to the commercial guide services.

# Appendix O

## Resource Management Plan Monitoring

### Introduction

The monitoring plan for the Resource Management Plan is tiered to the Monitoring and Evaluation Plan for the Supplemental Environmental Impact Statement Record of Decision. That Monitoring and Evaluation Plan is not yet fully refined. Therefore, this Monitoring Plan is not complete. The BLM has been, and will continue to be, a full participant in the development of the Supplemental Environmental Impact Statement Monitoring and Evaluation Plan. Ongoing BLM effectiveness and validation monitoring will continue where it is relevant to Resource Management Plan direction (for example, stocking surveys, threatened and endangered species studies, and water quality measurements).

### All Land Use Allocations

#### Expected Future Conditions and Outputs

Protection of Supplemental Environmental Impact Statement special attention species so as not to elevate their status to any higher level of concern.

#### Implementation Monitoring

##### Questions

1. Are surveys for the species listed in Appendix E conducted before ground-disturbing activities occur?
2. Are protection buffers being provided for specific rare and locally endemic species and other species in the upland forest matrix?
3. Are the known sites of amphibians, mammals, bryophytes, mollusks, vascular plants, fungi, lichens, and arthropod species listed in Appendix E being protected?
4. Are the known sites of amphibians, mammals, bryophytes, mollusks, vascular plants, fungi, lichens, and arthropod species listed in Appendix E being surveyed?
5. Are high priority sites for species management being identified?
6. Are general regional surveys being conducted to acquire additional information and to determine necessary levels of protection for arthropods, fungi species that were not classed as rare and endemic, bryophytes, and lichens?

##### Monitoring Requirements

1. At least twenty percent of all ground disturbing management actions will be examined prior to project initiation and re-examined following project completion, to determine if: surveys are conducted for species listed in Appendix E, protection buffers are provided for specific rare and locally endemic species and other species in the upland forest matrix, and sites of species listed in Appendix E are protected.
2. The Annual Program Summary will address Implementation Questions 4-6.

## **Effectiveness and Validation Monitoring**

### **Questions**

1. Are measures taken to protect the Supplemental Environmental Impact Statement special attention species effective?

### **Monitoring Requirements**

Deferred to Supplemental Environmental Impact Statement Monitoring Plan.

## **Riparian Reserves**

### **Expected Future Conditions and Outputs**

See Aquatic Conservation Strategy Objectives.

Provision of habitat for special status and Supplemental Environmental Impact Statement special attention species.

### **Implementation Monitoring**

#### **Questions**

1. Are watershed analyses being completed before on-the-ground actions are initiated in Riparian Reserves?
2. Is the width and integrity of the Riparian Reserves being maintained? (For example, did the conditions that existed before management activities change in ways that are not in accordance with the Supplemental Environmental Impact Statement Record of Decision Standards and Guidelines and resource management plan management direction?)
3. What silvicultural practices are being applied to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy Objectives?
4. Are management activities in Riparian Reserves consistent with Supplemental Environmental Impact Statement Record of Decision Standards and Guidelines, resource management plan management direction, and Aquatic Conservation Strategy Objectives?
5. Are new structures and improvements in Riparian Reserves constructed to minimize the diversion of natural hydrologic flow paths, reduce the amount of sediment delivery into the stream, protect fish and wildlife populations, and accommodate the 100-year flood?
6. A) Are all mining structures, support facilities and roads located outside the Riparian Reserves? B) Are those located within the Riparian Reserves meeting the objectives of the Aquatic Conservation Strategy? C) Are all solid and sanitary waste facilities excluded from Riparian Reserves or located, monitored, and reclaimed in accordance with Supplemental Environmental Impact Statement Record of Decision Standards and Guidelines, and resource management plan management direction?
7. Are new recreation facilities within the Riparian Reserves designed to meet, and where practicable, contribute to Aquatic Conservation Strategy Objectives? Are mitigation measures initiated where existing recreation facilities are not meeting Aquatic Conservation Strategy Objectives?
8. Are new livestock handling and/or management facilities located outside Riparian Reserves? Are existing livestock handling and/or management facilities within the Riparian Reserves meeting the Aquatic Conservation Strategy Objectives?

## **Monitoring Requirements**

1. The files on each year's on-the-ground actions will be checked annually to ensure that watershed analyses were completed prior to project initiation and to ensure the concerns identified in the watershed analysis were addressed in the project's Environmental Assessment.
2. At least twenty percent of management activities within the resource area will be examined prior to project initiation and re-examined following project completion, to determine whether the width and integrity of the Riparian Reserves were maintained.
3. The Annual Program Summary will report what silvicultural practices are being applied in order to attain Aquatic Conservation Strategy Objectives.
4. At least twenty percent of the activities that are conducted or authorized within Riparian Reserves will be reviewed in order to identify whether the actions were consistent with the Supplemental Environmental Impact Statement Record of Decision Standards and Guidelines, resource management plan management direction, and Aquatic Conservation Strategy Objectives. In addition to reporting the results of this monitoring, the Annual Program Summary will also summarize the types of activities that were conducted or authorized within Riparian Reserves.
5. All new structures and improvements within a Riparian Reserve will be monitored during and after construction to ensure that it was constructed to: minimize the diversion of natural hydrologic flow paths, reduce the amount of sediment delivery into the stream, protect fish and wildlife populations and accommodate the 100-year flood.
6. All approved mining Plans of Operations will be reviewed to determine if: A) both a reclamation plan and bond were required; B) structures, support facilities and roads were located outside of Riparian Reserves, or in compliance with Aquatic Conservation Strategy objectives if located inside the Riparian Reserve; and C) if solid and sanitary waste facilities were excluded from Riparian Reserves or located, monitored and reclaimed in accordance with resource management plan management direction.
7. The Annual Program Summary will examine the status of evaluations of existing recreational facilities inside Riparian Reserves, to ensure that Aquatic Conservation Strategy Objectives are met. The Summary will also report on the status of the mitigation measures initiated where the Aquatic Conservation Strategy objectives cannot be met.
8. The Annual Program Summary will report the status of evaluations of existing and proposed livestock management facilities inside Riparian Reserves, to determine if Aquatic Conservation Strategy Objectives are met. The Summary will also report on the status of relocating those facilities where Aquatic Conservation Strategy Objectives cannot be met.

## **Effectiveness and Validation Monitoring**

### **Questions**

1. Is the health of Riparian Reserves stable or improving?
2. Are management actions designed to rehabilitate Riparian Reserves effective?
3. If conditions in the Riparian Reserves are stable or declining, are management activities contributing to the decline or preventing improvement?

### **Monitoring Requirements**

Deferred to Supplemental Environmental Impact Statement Monitoring Plan.

## Late-Successional Reserves

### Expected Future Conditions and Outputs

Development and maintenance of a functional, interacting, late-successional and old-growth forest ecosystem in Late-Successional Reserves.

Protection and enhancement of habitat for late-successional and old-growth forest-related species including the northern spotted owl.

### Implementation Monitoring

#### Questions

1. What is the status of the preparation of assessments and fire plans for Late-Successional Reserves?
2. What activities were conducted or authorized within Late-Successional Reserves and how were they compatible with the objectives of the Late-Successional Reserve plan? Were the activities consistent with Supplemental Environmental Impact Statement Record of Decision Standards and Guidelines, resource management plan management direction and Regional Ecosystem Office review requirements and the Late-Successional Reserve assessment?
3. What is the status of development and implementation of plans to eliminate or control non-native species which adversely impact late-successional objectives?
4. Are the effects of existing and proposed livestock management and handling facilities in Late-Successional Reserves being evaluated to determine if Late-Successional Reserve objectives are met? Are livestock management and/or handling facilities relocated where Late-Successional Reserve objectives are not met?

#### Monitoring Requirements

1. The Annual Program Summary will address Implementation Questions 1-3.
2. The Annual Program Summary will report the status of evaluations of existing and proposed livestock management facilities inside Late-Successional Reserves, to determine if reserve objectives are being met. The Summary will also report on the status of relocating those facilities where Late-Successional Reserve objectives cannot be met.

### Effectiveness and Validation Monitoring

#### Questions

1. Are forest management activities (for example, special forest/natural product harvest activities) within Late-Successional Reserves compatible with the goal of developing and maintaining a functional, interacting, late-successional and old-growth forest ecosystem?
2. Does the harvest of special forest products have adverse effects on Late-Successional Reserve objectives?
3. Is a functional, interacting, late-successional ecosystem maintained where adequate, and restored where inadequate?
4. Did silvicultural treatments benefit the creation and maintenance of late-successional conditions?
5. What is the relationship between levels of management intervention and the health and maintenance of late-successional and old-growth ecosystems?



## **Monitoring Requirements**

Deferred to Supplemental Environmental Impact Statement Monitoring Plan

## **Matrix**

### **Expected Future Conditions and Outputs**

Production of a stable supply of timber and other forest commodities.

Maintenance of important ecological functions such as dispersal of organisms, carryover of some species from one stand to the next, and maintenance of ecologically valuable structural components such as down logs, snags, and large trees.

Assurance that forests in the Matrix provide for connectivity between mapped Late-Successional Reserves.

Provision of habitat for a variety of organisms associated with early and late-successional forests.

## **Implementation Monitoring**

### **Questions**

1. Are suitable numbers of snags, coarse woody debris, and green trees being left, following timber harvest, as called for in the Supplemental Environmental Impact Statement Record of Decision Standards and Guidelines and resource management plan management direction?
2. Are timber sales being designed to meet ecosystem goals for the Matrix?
3. Are late-successional stands being retained in fifth-field watersheds in which federal forest lands have fifteen percent or less late-successional forest?

### **Monitoring Requirements**

1. At least twenty percent of timber sales in the resource area will be examined by pre- and post-harvest (and after site preparation) inventories to determine snag and green tree numbers, heights, diameters, and distribution within harvest units. Snags and green trees left following timber harvest activities (including site preparation for reforestation) will be compared to those that were marked prior to harvest.

The same timber sales will also be inventoried pre- and post-harvest to determine if Supplemental Environmental Impact Statement Record of Decision and resource management plan down log retention direction and protection buffers for special status and Supplemental Environmental Impact Statement special attention species have been followed.

2. At least twenty percent of the files on each year's timber sales will be reviewed annually to determine if ecosystem goals were addressed in the silvicultural prescriptions.
3. All proposed harvest timber sales in watersheds with less than 15 percent late-successional forest remaining will be reviewed prior to sale to ensure that a watershed analysis has been completed.

## **Effectiveness and Validation Monitoring**

### **Questions**

1. Are stands growing at a rate that produce the predicted yields?
2. Are forests in the Matrix providing for connectivity between mapped Late-Successional Reserves?
3. Is forest health being addressed?

### **Monitoring Requirements**

Deferred to the Supplemental Environmental Impact Statement Monitoring Plan.

## **Air Quality**

### **Expected Future Conditions and Outputs**

Attainment of National Ambient Air Quality Standards, Prevention of Significant Deterioration goals, and Oregon Visibility Protection Plan and Smoke Management Plan goals.

Maintenance and enhancement of air quality and visibility in a manner consistent with the Clean Air Act and the State Implementation Plan.

### **Implementation Monitoring**

#### **Questions**

1. Were efforts made to minimize the amount of particulate emissions from prescribed burns?
2. Are dust abatement measures used during construction activities and on roads during BLM timber harvest operations and other BLM commodity hauling activities?
3. Are conformity determinations being prepared prior to activities which may contribute to a new violation of the National Ambient Air Quality Standards, increase the frequency or severity of an existing violation, or delay the timely attainment of a standard?

#### **Monitoring Requirements**

1. At least twenty percent of prescribed burn projects will be randomly selected for monitoring to assess what efforts were made to minimize particulate emissions, and whether the environmental analysis that preceded the decision to burn addressed the questions set forth in the Supplemental Environmental Impact Statement discussion of Emission Monitoring (pages 3&4-100).
2. At least twenty percent of the construction activities and commodity hauling activities will be monitored to determine if dust abatement measures were implemented.
3. The Annual Program Summary will address Implementation Question 3.



## **Effectiveness and Validation Monitoring**

### **Questions**

1. What techniques were the most effective in minimizing the amount of particulate emissions from prescribed burns?
2. Are BLM prescribed burns contributing to intrusions into Class I areas or non-attainment areas?
3. Of the intrusions that the BLM is reported to be responsible for, what was the cause and what can be done to minimize future occurrences?
4. Are BLM prescribed underburns causing adverse air quality impacts to rural communities?
5. Are prescribed fires decreasing the actual or potential impacts from wildfire emissions?

### **Monitoring Requirements**

Deferred to Supplemental Environmental Impact Statement Monitoring Plan.

## **Water and Soils**

### **Expected Future Conditions and Outputs**

Restoration and maintenance of the ecological health of watersheds. See Aquatic Conservation Strategy Objectives.

Compliance with state water quality requirements to restore and maintain water quality to protect recognized beneficial uses.

Improvement and/or maintenance of soil productivity.

Reduction of existing open road mileage within all watersheds.

## **Implementation Monitoring**

### **Questions**

1. Are site specific Best Management Practices, identified as applicable during interdisciplinary review, carried forward into project design and execution?
2. Are the prescribed actions, programs and interagency coordination efforts called for in the Supplemental Environmental Impact Statement Record of Decision Standards and Guidelines and resource management plan management direction being conducted?
3. What watershed analyses have been or are being performed? Are watershed analyses being performed prior to management activities in Key Watersheds?
4. What is the status of identification of in-stream flow needs for the maintenance of channel conditions, aquatic habitat, and riparian resources?
5. What watershed restoration projects are being developed and implemented?
6. What fuel treatment and fire suppression strategies have been developed to meet Aquatic Conservation Strategy Objectives?

## **Appendix O - Resource Management Plan Monitoring**

7. What is the status of development of road or transportation management plans to meet Aquatic Conservation Strategy Objectives?
8. What is the status of preparation of criteria and standards which govern the operation, maintenance, and design for the construction and reconstruction of roads?
9. What is the status of the reconstruction of roads and associated drainage features identified in watershed analysis as posing a substantial risk? What is the status of closure or elimination of roads to further Aquatic Conservation Strategy Objectives; and to reduce the overall road mileage within all watersheds? If funding is insufficient to implement road mileage reductions, are construction and authorizations through discretionary permits, denied to prevent a net increase in road mileage in Key Watersheds?
10. What is the status of reviews of ongoing research in Key Watersheds to insure that significant risk to the watershed does not exist?
11. What is the status of evaluation of recreation, interpretive and user-enhancement activities/facilities to determine their effects on the watershed? What is the status of eliminating or relocating these activities/facilities when found to be in conflict with Aquatic Conservation Strategy Objectives?
12. What is the status of cooperation with other agencies in the development of watershed-based Research Management Plans and other cooperative agreements to meet Aquatic Conservation Strategy Objectives? What is the status of cooperation with other agencies to identify and eliminate wild ungulate impacts which are inconsistent with attainment of Aquatic Conservation Strategy objectives?
13. Are management practices achieving the goal of maintaining long-term site productivity by avoiding, minimizing, or ameliorating soil compaction, displacement, surface erosion, and loss of organic material, including coarse woody debris?

## **Monitoring Requirements**

1. All management activities using best management practices will be monitored to determine whether best management practices are incorporated in the project design.
2. At least twenty percent of the timber sales, silviculture projects, or other ground disturbing activities stratified by management category will be randomly selected for monitoring to determine whether or not best management practices were implemented as prescribed. The selection of management actions to be monitored will be based on beneficial uses likely to be impacted, and for which best management practices are being prescribed.
3. Compliance checks will be completed for all agreements entered into with providers of municipal water.
4. The Annual Program Summary will address Implementation Questions 3-11.
5. Baseline monitoring will continue in the resource area to determine long-term trends and to provide a basis of separating changes in water quality resulting from natural events from those potentially created by management actions.
6. Two stream miles per year will be monitored to determine whether stream ecosystem objectives, such as maintenance of stream function, are being met.

## **Effectiveness and Validation Monitoring**

### **Questions**

1. Is the ecosystem function of the watersheds improving?
2. Are State water quality criteria being met? When State water quality criteria is met, are the beneficial uses of riparian areas protected?

3. Are prescribed best management practices maintaining or restoring water quality consistent with basin specific State water quality criteria for protection of specified beneficial uses?

## **Monitoring Requirements**

Deferred to Supplemental Environmental Impact Statement Monitoring Plan

# **Wildlife Habitat**

## **Expected Future Conditions and Outputs**

Maintenance of biological diversity and ecosystem health to contribute to healthy wildlife populations, consistent with BLM's Fish and Wildlife 2000 plan and other nationwide initiatives.

Maintenance of desired conditions in each special habitat (such as meadows, wetlands, and cliff/talus slopes), plus desired conditions in buffers at least 100 feet wide around dry meadows, and wooded swamps.

## **Implementation Monitoring**

### **Questions**

1. Are suitable (diameter, length and numbers) of snags, coarse woody debris and green trees being left, in a manner that meets the needs of species and provides for ecological functions in harvested areas as called for in the Supplemental Environmental Impact Statement Record of Decision Standards and Guidelines and resource management plan management direction?
2. Are special habitats being identified and protected?
3. What is the status of designing and implementing wildlife restoration projects?
4. What is the status of designing and constructing wildlife interpretive and other user-enhancement facilities?
5. Are elk herds on BLM-administered lands stable or increasing?
6. Are range conditions stable or is there obvious competition between resources?
7. Are facilities or improvements functional and providing desired management results?
8. Is the BLM protecting special habitats as provided for in the resource management plan?
9. Is the average width of undisturbed buffers retained following timber harvest and site preparation activities as specified in the resource management plan?

## **Monitoring Requirements**

1. At least twenty percent of regeneration harvest timber sales in each resource area will be examined by pre- and post-harvest (and after site preparation) inventories to determine snag and green tree numbers, heights, diameters and distribution within harvest units. The measure of distribution of snags and green trees will be the percent in the upper, middle and lower thirds of the sale units monitored. Snags and green trees left following timber harvest activities (including site preparation for reforestation) will be compared to those that were marked prior to harvest.

The same timber sales will also be inventoried pre- and post-harvest to determine if Supplemental Environmental Impact Statement Record of Decision and resource management plan down log retention direction has been followed.

## **Appendix O - Resource Management Plan Monitoring**

2. At least twenty percent of BLM actions, within the resource area, on lands including or near special habitats will be examined to determine whether special habitats were protected.
3. The Annual Program Summary will address Implementation Questions 3 and 4.
4. Examine twenty percent of BLM actions on lands containing or near special habitats to determine whether special habitats were protected as provided for in the resource management plan. Determine average buffer widths by measurements at approximately equidistant points around the affected unique habitat within each timber sale unit.
6. Monitor the effects of BLM management on wildlife species using a variety of methods. Coordinate surveys of game species with the Oregon Department of Fish and Wildlife. Conduct monitoring of other species and habitats as needed, such as neotropical migrant birds by vegetation community, individual species surveys when needed, and vegetation surveys as part of the timber and range management activities.
7. Maintain and check management facilities (such as guzzlers, springs, road closures, etc.) periodically to ensure that they are functioning properly.

## **Effectiveness and Validation Monitoring**

### **Questions**

1. Are habitat conditions for late-successional forest associated species maintained where adequate, and restored where inadequate?
2. Are the snags, green trees and coarse woody debris being left, achieving the habitat necessary to attain the desired population at a relevant landscape level?
3. Are BLM actions intended to protect special habitats actually protecting the habitat? Is the protection of special habitats helping to protect the species population?
4. What are the effects of management on species richness (numbers and diversity)?

### **Monitoring Requirements**

Deferred to Supplemental Environmental Impact Statement Monitoring Plan (Which will address a variety of wildlife species such as amphibians, mollusks, neotropical migratory birds, etc.)

## **Fish Habitat**

### **Expected Future Conditions and Outputs**

See Aquatic Conservation Strategy Objectives.

Maintenance or enhancement of the fisheries potential of streams and other waters, consistent with BLM's *Fish and Wildlife 2000 Plan*, the Bring Back the Natives initiative, and other nationwide initiatives.

Rehabilitation and protection of at-risk fish stocks and their habitat.

## **Implementation Monitoring**

### **Questions**

1. Are at-risk fish species and stocks being identified?
2. Are fish habitat restoration and enhancement activities being designed and implemented which contribute to attainment of Aquatic Conservation Strategy Objectives?
3. Are potential adverse impacts to fish habitat and fish stocks being identified?
4. Are habitat improvement projects and opportunities being identified?
5. Are fish populations adequate to provide present and expected future recreational needs?

### **Monitoring Requirements**

1. The Annual Program Summary will report on the status of watershed analysis to identify at-risk fish species and stocks, their habitat within individual watersheds, and restoration project needs.
2. The Annual Program Summary will report on the status of the design and implementation of fish habitat restoration and habitat activities.
3. The Annual Program Summary will report on the status of cooperation with federal, tribal and state fish management agencies to identify and eliminate impacts associated with poaching, harvest, habitat manipulation and fish stocking which threaten the continued existence and distribution of native fish stocks inhabiting federal lands. The Summary will also identify any management activities or fish interpretive and other user-enhancement facilities which have detrimental effects on native fish stocks.
4. At least twenty percent of the files on each year's timber sales, and other relevant actions, will be reviewed annually to evaluate documentation regarding fish species and habitat and related recommendations and decisions in light of policy and Supplemental Environmental Impact Statement Record of Decision Standards and Guidelines and resource management plan management direction. If mitigation was required, review will ascertain whether such mitigation was incorporated in the authorization document and the actions will be reviewed on the ground after completion to ascertain whether the mitigation was carried out as planned.
5. Monitor lakes and fish populations, and stock if necessary.

## **Effectiveness and Validation Monitoring**

### **Questions**

1. Is the ecological health of the aquatic ecosystems recovering or sufficiently maintained to support stable and well-distributed populations of fish species and stocks?
2. Is fish habitat in terms of quantity and quality of rearing pools, coarse woody debris, water temperature and width to depth ratio being maintained or improved as predicted?
3. Are desired habitat conditions for listed, sensitive, and at-risk fish stocks maintained where adequate, and restored where inadequate?

### **Monitoring Requirements**

Deferred to Supplemental Environmental Impact Statement Monitoring Plan

# **Special Status and Supplemental Environmental Impact Statement Special Attention Species Habitat**

## **Expected Future Conditions and Outputs**

Protection, management and conservation of federal listed and proposed species and their habitats, to achieve their recovery in compliance with the Endangered Species Act (ESA) and Bureau special status species policies.

Conservation of federal candidate and Bureau sensitive species and their habitats so as not to contribute to the need to list, and to recover the species.

Conservation of state listed species and their habitats to assist the state in achieving management objectives.

Maintenance or restoration of community structure, species composition, and ecological processes of special status plant and animal habitat.

Protection of Bureau assessment species and Supplemental Environmental Impact Statement special attention species so as not to elevate their status to any higher level of concern.

## **Implementation Monitoring**

### **Questions**

1. Are special status species being addressed in deciding whether or not to go forward with forest management and other actions? During forest management and other actions that may disturb special status species, are steps taken to adequately mitigate disturbances?
2. Are the actions identified in plans to recover species being implemented in a timely manner?
3. What coordination with other agencies has occurred in the management of special status species?
4. What land acquisitions occurred or are under way, to facilitate the management and recovery of special status species?
5. What site specific plans for the recovery of special status species were or are being developed?
6. What is the status of analysis which ascertains species requirements or enhances the recovery or survival of a species?
7. What is the status of efforts to maintain or restore the community structure, species composition and ecological processes of special status plant and animal habitat?

### **Monitoring Requirements**

1. At least twenty percent of the files on each year's timber sales, range improvements, grazing decisions, and other relevant actions (for example, rights-of-way, instream structures) will be reviewed annually to evaluate documentation regarding special status species and related recommendations and decisions in light of the Endangered Species Act requirements, policy and Supplemental Environmental Impact Statement Record of Decision Standards and Guidelines and resource management plan management direction. If mitigation was required, review will ascertain whether such mitigation was incorporated in the authorization document and the actions will be reviewed on the ground after completion to ascertain whether the mitigation was carried out as planned.
2. Review implementation schedule and actions taken annually, to ascertain if the actions to recover species were carried out as planned.



3. The Annual Program Summary will address Implementation Questions 3-7.

## **Effectiveness and Validation Monitoring**

### **Questions**

1. Are trends for special status species meeting the objectives of mitigation and/or conservation actions?
2. Have any Federal Candidates, Bureau Assessment or Bureau Sensitive species been elevated to higher levels of concern due to BLM management?
3. Were desired habitat conditions for the late-successional species maintained where adequate and restored where inadequate?

### **Monitoring Requirements**

Deferred to Supplemental Environmental Impact Statement Monitoring Plan (Which will address a variety of special status species including the bald eagle, northern spotted owl, etc.)

## **Special Areas**

### **Expected Future Conditions and Outputs**

Maintenance, protection, and/or restoration of the relevant and important values of the special areas which include: Areas of Critical Environmental Concern, Research Natural Areas, and Environmental Education Areas.

Preservation, protection, or restoration of native species composition and ecological processes of biological communities in research natural areas.

Preservation, protection or restoration of native species composition and ecological processes of biological communities in research natural areas.

Retention of existing research natural areas and existing areas of critical environmental concern that meet the test for continued designation. Retention of other special areas. Provision of new special areas where needed to maintain or protect important values.

## **Implementation Monitoring**

### **Questions**

1. Are BLM actions and BLM authorized actions/uses near or within special areas consistent with resource management plan objectives and management direction for special areas?
2. What is the status of the preparation, revision, and implementation of areas of critical environmental concern management plans?
3. What environmental education and research initiatives and programs are occurring in the research natural areas and environmental education areas?
4. Are existing BLM actions and BLM authorized actions and uses not consistent with management direction for special areas being eliminated or relocated?

## **Appendix O - Resource Management Plan Monitoring**

5. Are actions being identified which are needed to maintain or restore the important values of the special areas? Are the actions being implemented?

### **Monitoring Requirements**

1. Annually, the files on all actions and research proposals within and adjacent to special areas will be reviewed to determine whether the possibility of impacts on areas of critical environmental concern values was considered, and whether any mitigation identified as important for maintenance of areas of critical environmental concern values was required. If mitigation was required, the relevant actions will be reviewed on the ground, after completion, to ascertain whether it was actually implemented.
2. The Annual Program Summary will address Implementation Questions 2-7.

## **Effectiveness and Validation Monitoring**

### **Questions**

1. Are the implemented management actions, designed to protect the values of the special areas, effective?
2. Are the special areas managed to restore or prevent the loss of outstanding values and minimize disturbance?

### **Monitoring Requirements**

1. Each special area will be monitored at least every three years to determine if the values for which it was designated are being maintained.
2. Each area of critical environmental concern will be monitored annually to determine if pro-active management actions met their objectives.

# **Cultural Resources Including American Indian Values**

## **Expected Future Conditions and Outputs**

Identification of cultural resource localities for public, scientific, and cultural heritage purposes.

Conservation and protection of cultural resource values for future generations.

Provision of information on long-term environmental change and past interactions between humans and the environment.

Fulfillment of responsibilities to appropriate American Indian groups regarding heritage and religious concerns.

## **Implementation Monitoring**

### **Questions**

1. Are cultural resources being addressed in deciding whether or not to go forward with forest management and other actions? During forest management and other actions that may disturb cultural resources, are steps taken to adequately mitigate disturbances?
2. What mechanisms have been developed to describe past landscapes and the role of humans in shaping those landscapes?

3. What efforts are being made to work with American Indian groups to accomplish cultural resource objectives and achieve goals outlined in existing memoranda of understanding and develop additional memoranda as needs arise?
4. What public education and interpretive programs were developed to promote the appreciation of cultural resources?

### **Monitoring Requirements**

1. At least twenty percent of the files on each year's timber sales and other relevant actions (for example, rights-of-way, instream structures) will be reviewed annually to evaluate documentation regarding cultural resources and American Indian values and decisions in light of requirements, policy, and Supplemental Environmental Impact Statement Record of Decision Standards and Guidelines and resource management plan management direction. If mitigation was required, review will ascertain whether such mitigation was incorporated in the authorization document and the actions will be reviewed on the ground after completion to ascertain whether the mitigation was carried out as planned.
2. The Annual Program Summary will address Implementation Questions 2-4.

## **Effectiveness and Validation Monitoring**

### **Questions**

1. Are sites of cultural heritage (including religious) and traditional use adequately protected?
2. Do American Indians have access to and use of forest species, resources and places important for cultural, subsistence, or economic reasons; particularly those identified in treaties?

### **Monitoring Requirements**

1. All cultural resource sites, where management and/or mitigation measures are utilized to protect the resource, will be monitored at least once a year to determine if the measures were effective.

The balance is deferred to Supplemental Environmental Impact Statement Monitoring Plan.

## **Visual Resources**

### **Expected Future Conditions and Outputs**

Preservation or retention of the existing character of landscapes on BLM-administered lands allocated for Visual Resource Management Class I and II management; partial retention of the existing character on lands allocated for Visual Resource Management Class III management and major modification of the existing character of some lands allocated for Visual Resource Management Class IV management.

Continuation of emphasis on management of scenic resources in selected high-use areas to retain or preserve scenic quality.

### **Implementation Monitoring**

#### **Questions**

1. Are visual resource design features and mitigation methods being followed during timber sales and other substantial actions in Visual Resource Management Class II, III, and IV areas?

#### **Monitoring Requirements**

1. Twenty percent of the files for timber sales and other substantial projects in Visual Resource Management Class II or III areas will be reviewed to ascertain whether relevant design features or mitigating measures were included.

### **Effectiveness and Validation Monitoring**

#### **Questions**

1. Are timber sales and other major actions in Visual Resource Management Class II, III, and IV areas meeting or exceeding visual resource management objectives?
2. Are visual resource management objectives being met consistently, over long periods of time, in Visual Resource Management Class II management areas?

#### **Monitoring Requirements**

1. All timber sales and other selected projects in Visual Resource Management Class II areas and at least twenty percent of sales or projects in Class III areas that have special design features, or mitigating measures for visual resource protection, will be monitored to evaluate the effectiveness of the practices used to conserve visual resources.
2. In Visual Resource Management Class II management areas, where two or more sales or actions have occurred, impacts will be monitored at a minimum interval of five years.

# Wild and Scenic Rivers

## Expected Future Conditions and Outputs

Protection of the outstandingly remarkable values of designated components of the National Wild and Scenic Rivers System through the maintenance and enhancement of the natural integrity of river-related values.

Protection of the outstandingly remarkable values of eligible/suitable Wild and Scenic Rivers (the upper Klamath River) and the maintenance or enhancement of the highest tentative classification (scenic) pending resolution of suitability and/or designation.

Designation of important and manageable river segments suitable for designation where such designation contributes to the National Wild and Scenic Rivers System.

## Implementation Monitoring

### Questions

1. Are BLM actions and BLM authorized actions consistent with protection of the outstandingly remarkable values of designated or suitable rivers?
2. Are existing plans being revised to conform to Aquatic Conservation Strategy Objectives? Are revised plans being implemented?
3. Do actions and plans address maintenance or enhancement of the outstandingly remarkable values?

### Monitoring Requirements

1. Annually, the files on all actions and research proposals within and adjacent to Wild and Scenic River corridors will be reviewed to determine whether the possibility of impacts on the outstandingly remarkable values was considered, and whether any mitigation identified as important for maintenance of the values was required. If mitigation was required, the relevant actions will be reviewed on the ground, after completion, to ascertain whether it was actually implemented.
2. The Annual Program Summary report will summarize progress on preparation and revision of Wild and Scenic River management plans, their conformance with the Aquatic Conservation Strategy Objectives, and the degree to which these plans have been implemented.

## Effectiveness and Validation Monitoring

### Questions

1. Are the outstandingly remarkable values for designated rivers being maintained?
2. Are the outstandingly remarkable values of the suitable rivers protected?

### Monitoring Requirements

1. Each designated river will be monitored at least once a year to determine if the outstandingly remarkable values are being maintained.
2. Each suitable river will be monitored at least once a year to determine if the outstandingly remarkable values are being maintained.

## **Rural Interface Areas**

### **Expected Future Conditions and Outputs**

Consideration of the interests of adjacent land owners, including residents, during analysis, planning, and monitoring related to managed rural interface areas. These areas are defined as public lands within ¼ mile of identified rural interface areas zoned for one to twenty acre lots. (These interests include personal health and safety, improvements to property, and quality of life.)

Determination of how land owners might be or are affected by activities on BLM-administered land.

### **Implementation Monitoring**

#### **Questions**

1. Are design features and mitigation measures developed and implemented to avoid/minimize impacts to health, life and property and quality of life and to minimize the possibility of conflicts between private and federal land management?

#### **Monitoring Requirements**

1. At least twenty percent of all actions within the identified rural interface areas will be examined to determine if special project design features and mitigation measures were included and implemented as planned.

### **Effectiveness and Validation Monitoring**

#### **Questions**

1. Are the rural interface area design features and mitigation measures effective in minimizing impacts to health, life, and property?

#### **Monitoring Requirements**

1. At least twenty percent of actions within the identified rural interface areas which had design features or mitigation measures will be examined following completion to assess the effectiveness of the action.



# **Socioeconomic Conditions**

## **Expected Future Conditions and Outputs**

Contribution to local, state, national and international economies through sustainable use of BLM-managed lands and resources and use of innovative contracting and other implementation strategies.

Provision of amenities for the enhancement of communities as places to live and work.

## **Implementation Monitoring**

### **Questions**

1. What strategies and programs have been developed, through coordination with state and local governments, to support local economies and enhance local communities?
2. Are resource management plan implementation strategies being identified that support local economies?
3. What is the status of planning and developing amenities that enhance local communities, such as recreation and wildlife viewing facilities?

### **Monitoring Requirements**

1. The Annual Program Summary will address Implementation Questions 1-3.

## **Effectiveness and Validation Monitoring**

### **Questions**

1. What level of local employment is supported by BLM timber sales and forest management practices?
2. What were Oregon and California payments to counties?

### **Monitoring Requirements**

Deferred to Supplemental Environmental Impact Statement Monitoring Plan.

## **Recreation**

### **Expected Future Conditions and Outputs**

Provision of a wide range of developed and dispersed recreation opportunities that contribute to meeting projected recreation demand within the planning area.

Provision of nonmotorized recreational opportunities and creation of additional opportunities consistent with other management objectives.

### **Implementation Monitoring**

#### **Questions**

1. What is the status of the development and implementation of recreation plans?

#### **Monitoring Requirements**

1. The Annual Program Summary will address Implementation Question 1.

### **Effectiveness and Validation Monitoring**

#### **Questions**

1. Based on the Statewide Comprehensive Outdoor Recreation Plan supply and demand data and public comments, is the range of recreation opportunities on BLM lands (that is, roaded vs. unroaded) meeting public needs?
2. Are BLM developed recreation facilities meeting public needs and expectations, including facility condition and visitor safety considerations?
3. Are off-highway vehicle designations adequate to protect resource values while providing appropriate motorized vehicle recreation opportunities?
4. Are non-developed recreation activities conflicting with other resource values?

#### **Monitoring Requirements**

1. Each Special Recreation Management Area will be monitored at least every three years to determine if the types of recreation opportunities being provided are appropriate.
2. All developed recreation sites will be monitored annually to determine if facilities are being properly managed and all deficiencies documented.
3. All off-highway vehicle designations will be reviewed annually to determine if revisions are necessary to protect resource values and resolve user conflicts.

# Timber Resources

## Expected Future Conditions and Outputs

Provision of a sustained yield of timber and other forest products.

Reduction of the risk of stand loss due to fires, animals, insects, and diseases.

Provision of salvage harvest for timber killed or damaged by events such as wildfire, windstorms, insects, or disease, in a manner consistent with management objectives for other resources.

Maintenance or restoration of healthy ecosystems while providing for the harvest of timber and other forest products in balance with other resource values and needs.

## Implementation Monitoring

### Questions

1. By land-use allocation, how do timber sale volumes, harvested acres, and the age and type of regeneration harvest stands compare to the projections in the Supplemental Environmental Impact Statement Record of Decision Standards and Guidelines and resource management plan management objectives?
2. Were the silvicultural (for example, planting with genetically selected stock, fertilization, release, and thinning) and forest health practices anticipated in the calculation of the expected sale quantity, implemented?

### Monitoring Requirements

1. The Annual Program Summary will report both planned and non-planned volumes sold. The report will also summarize annual and cumulative timber sale volumes, acres to be harvested, and types of harvest for General Forest Management Areas, and stratified to identify them individually.
2. An annual district wide report will be prepared to determine if the silvicultural and forest health practices identified and used in the calculation of the probable sale quantity were implemented. This report will be summarized in the Annual Program Summary.

## Effectiveness and Validation Monitoring

### Questions

1. Is reforestation achieving desired stocking?
2. Are stands growing at a rate that will produce the predicted yields?
3. Is the long-term health and productivity of the forest ecosystem being protected in the Matrix?

### Monitoring Requirements

1. First, third, and fifth year surveys will be used to determine if reforestation is meeting reforestation objectives.

The balance is deferred to Supplemental Environmental Impact Statement Monitoring Plan.

## **Special Forest/Natural Products**

### **Expected Future Conditions and Outputs**

Production and sale of special forest/natural products when demand is present and where actions taken are consistent with primary objectives for the land use allocation.

Utilization of the principles of ecosystem management to guide the management and harvest of special forest/natural products.

### **Implementation Monitoring**

#### **Questions**

1. Is the sustainability and protection of special forest/natural product resources ensured prior to selling special forest products?
2. What is the status of the development and implementation of specific guidelines for the management of individual special forest/natural products?

#### **Monitoring Requirements**

1. The Annual Program Summary will address Implementation Questions 1 and 2.

### **Effectiveness and Validation Monitoring**

#### **Questions**

1. Are special forest products being harvested at a sustainable level?

#### **Monitoring Requirements**

Deferred to Supplemental Environmental Impact Statement Monitoring Plan.

## **Grazing Management**

### **Expected Future Conditions and Outputs**

The livestock and wild horse grazing programs will be managed under the principles of multiple use and sustained yield. Monitor the existing grazing allotments and the wild horse herd management area in compliance with the established "Coordinated Monitoring and Evaluation Plan for Grazing Allotments" for the Klamath Falls Resource Area. Monitoring data will be the foundation to support adjustments in the management of grazing use by livestock and wild horses. Evaluation of the monitoring data, in relation to the identified allotment objectives in this Proposed Resource Management Plan as well as future standards and guidelines, will be completed through a team of interdisciplinary resource specialists, with public review as appropriate. (See Appendix L, Rangeland Monitoring and Evaluation section for an overview of the studies and evaluation process.)

## **Implementation Monitoring**

### **Questions**

1. Are allotment and herd management area goals and objectives being achieved with current management as specified on a allotment specific basis?
2. Are the appropriate standards and guidelines, applicable to livestock and wild horse grazing, being correctly applied and followed?
3. Are rangeland improvement projects consistent with meeting the objectives of all resources addressed in this Presource management plan as well as the Aquatic Conservation Strategy and Late-Successional/District Designated Reserve objectives?

### **Monitoring Requirements**

1. The Annual Program Summary will report on the implementation of this Proposed Resource Management Plan within the Grazing Management and Wild Horse programs. The report will summarize changes in grazing management systems, timing, and levels of use; allotment evaluations; range improvements planned and/or completed; management actions or changes within the herd management area; activity planning efforts; grazing related objectives and priority changes or additions; and other grazing program related items as pertinent.

## **Effectiveness and Validation Monitoring**

### **Questions**

1. Are current grazing systems and levels effectively enhancing riparian and wetland sites as emphasized in this Proposed Resource Management Plan and the Aquatic Conservation Strategy Objectives.
2. Are current grazing levels within the sustained yield capacity of the lands potential?
3. Rangeland improvement projects consistent with meeting the objectives of all resources addressed in the Proposed Resource Management Plan as well as the Aquatic Conservation Strategy and Late-Successional/District Designated Reserve objectives?

### **Monitoring Requirements**

1. Use approved Bureau monitoring techniques to analyze the effect of present management systems. Monitoring studies data is the information used to ascertain if resource goals and objectives are being met, in both riparian/wetland and upland areas. Monitoring will be done as outlined and schedules in the Klamath Falls Resource Area's "Coordinated Monitoring and Evaluation Plan for Grazing Allotments".
2. Evaluate allotments and the herd management area, based on their priority and selective management categories, within established time frames found in the Oregon Rangeland Monitoring Handbook, the above reference plan, Bureau regulations, and technical references. Make adjustments in management, as necessary, based on these evaluations.
3. When completed, Ecological Site Inventory data will be used to establish desired plant community objectives for the major rangeland vegetative communities. (The Ecological Site Inventory is not expected to be completed until after the year 2000.)

## **Noxious Weeds**

### **Expected Future Conditions and Outputs**

Containment and/or reduction of noxious weed infestations on BLM-administered land using an integrated pest management approach.

Avoidance of the introduction or spread of noxious weed infestations in all areas.

### **Implementation Monitoring**

#### **Questions**

1. Are noxious weed control methods compatible with Aquatic Conservation Strategy Objectives?

#### **Monitoring Requirements**

1. Review the files of at least twenty percent of each year's noxious weed control applications to determine if noxious weed control methods were compatible with Aquatic Conservation Strategy Objectives.

### **Effectiveness and Validation Monitoring**

#### **Questions**

1. Are management actions effectively containing or reducing the extent of noxious weed infestations?

#### **Monitoring Requirements**

1. At least twenty percent of noxious weed sites subjected to treatment will be monitored to determine if the treatment was effective.

## **Fire/Fuels Management**

### **Expected Future Conditions and Outputs**

Provision of the appropriate suppression responses to wildfires in order to meet resource management objectives and minimize the risk of large-scale, high intensity wildfires.

Utilization of prescribed fire to meet resource management objectives. (This will include, but not be limited to, fuels management for wildfire hazard reduction, restoration of desired vegetation conditions, management of habitat, and silvicultural treatments.)

Adherence to smoke management/air quality standards of the Clean Air Act and State Implementation Plan standards for prescribed burning.



## **Implementation Monitoring**

### **Questions**

1. Have analysis and planning been completed to allow some natural fires to burn under prescribed conditions?
2. Do wildfire suppression plans emphasize maintaining late-successional habitat?
3. Are Wildfire Situation Analyses being prepared for wildfires that escape initial attack?
4. What is the status of the interdisciplinary team preparation and implementation of fuel hazard reduction plans?

### **Monitoring Requirements**

1. The Annual Program Summary will address Implementation Questions 1 - 4.

## **Effectiveness and Validation Monitoring**

### **Questions**

1. Are fire suppression strategies, practices, and activities meeting resource management objectives and concerns?
2. Are prescribed fires applied in a manner which retains the amount of coarse woody debris, snags, and duff at levels determined through watershed analysis?
3. Are fuel profiles being modified in order to lower the potential of fire ignition and rate of spread; and to protect and support land use allocation objectives by lowering the risk of high intensity, stand-replacing wildfires?

### **Monitoring Requirements**

Deferred to Supplemental Environmental Impact Statement Monitoring Plan.



# Appendix P

## Water Resources and Basic Hydrologic Principles

### Introduction

This appendix describes many of the principles and procedures used in the management of water resources in the Klamath Falls Resource Area. The analysis contained in this appendix is meant to supplement what is contained in the Soil, Water and Riparian-Wetland Area Resources sections of Chapter 4. In addition, Chapter 4, Appendix S, and this appendix incorporate by reference analyses contained in the Final Supplemental Impact Statement and its Record of Decision.

### Water Quantity

Oregon's latitude, topography, and location near the Pacific Ocean have a great influence upon its climate. The Coast and Cascade ranges play a major role in determining precipitation type and distribution. The prevailing air masses that move across Klamath County from the Pacific Ocean have been greatly modified as a result of their passage over the Cascade Range. Continental air masses that move down from the interior of western Canada are also a major weather factor. See the Climate section of Chapter 3 for more information.

Precipitation is an important climatic variable that influences the productivity and management of resource lands. Estimates of precipitation are used for planning numerous forest management activities, such as the location, design, and maintenance of roads, and the selection and scheduling of harvesting and reforestation systems.

Interception occurs when rain or snow lands on vegetation rather than the ground. Some of this intercepted water evaporates and the remainder falls to the ground. Water also evaporates from the surface of water bodies and soil. Under forested conditions, evaporation from soil surfaces is minimal. Evapotranspiration is the process in which water is taken up by plants and then evaporates into the atmosphere.

Infiltration is the movement of water into the soil surface. Surface runoff is the distribution of water after it precipitates on the land until it reaches stream channels, or penetrates the ground, or returns directly to the atmosphere through evapotranspiration. For example, when the rainfall rate exceeds the infiltration rate, water will travel over the ground surface, as surface runoff, to a channel. Generally, surface runoff can be quantified as the precipitation amount minus surface retention, infiltration and evapotranspiration amounts. Infiltration rates in forest soils of south central Oregon usually exceed the maximum rates of rainfall, thus allowing most of the water that reaches the earth's surface to enter the soil.

Soil compaction can significantly change the hydrology of a watershed by reducing infiltration rates. Infiltration rates are reduced by soil disturbance and compaction associated with timber harvest activities when roads, tractor skid trails, and landings are built to remove timber. Compaction can also be caused by site preparation following timber harvest. Other changes in hydrology occur from the routing of runoff through culverts and ditches which causes rapid delivery of water to stream channels, possibly increasing the size of peak flows. Increases in peak flows appear to be related to the amount of soil compaction in a watershed, and can cause increased channel degradation and downstream sedimentation.

Soil compaction, and vegetation or ground cover removal can cause increases in surface runoff, which can affect the amount and timing of peak flows. Interception losses can be reduced, thus allowing more precipitation to reach the soil surface. The manipulation or removal of vegetation can affect the accumulation and melting of

snow. The level of influence is related to the type of vegetation treatment and the various climatic and physiographic conditions influencing the site. Wildfire, prescribed burning, site preparation (such as scarification) and grazing can reduce ground cover (live vegetation and litter) and, in turn, increase surface runoff. It is important to retain ground cover because vegetation and plant litter keep flowing water spread out over the surface of the land and mechanically retards or hinders runoff, so that water moves more slowly and more opportunity is allowed for infiltration or uptake by vegetation.

Livestock grazing affects watershed properties by alteration of plant cover and by soil compaction from the physical action of animal hooves. Reductions in vegetation cover may in turn increase the impact of raindrops, decrease soil organic matter and soil aggregates, increase surface crusts, and decrease water infiltration rates. These effects may cause increased runoff, reduced soil water content, and increased erosion. The hydrologic impacts of grazing intensity are related primarily to infiltration and runoff. Increased runoff can increase upland sheet and rill erosion, resulting in stream sedimentation. Increased peak runoff can also increase stream energy for bank erosion, downcutting, and gully formation. Reductions in water infiltration and storage can reduce the magnitude and duration of low flows. Grazing can remove protective ground cover and disturbs litter and soil, while trampling by grazing animals can compact surface soils. The amount and timing of peak flows from runoff is thought to be positively correlated with the intensity of grazing within a drainage. Adverse impacts to riparian vegetation from grazing can negatively affect the hydrology of a stream because riparian-wetland areas contribute to groundwater recharge and maintenance of flows.

## **Streamflow**

The amount of water draining from a given area in a year is referred to as the annual water yield and is usually expressed in acre-feet (1 acre-foot equals 43,560 cubic feet) or the average depth over an area in inches. The annual yield of an area can be converted to the average annual flow (in cubic feet per second) of the stream draining the area.

Streamflow is the water that reaches the stream channel. Total streamflow is a product of all the other processes in the hydrologic cycle. Distribution of annual streamflow in south central Oregon is related to the distribution and type of annual precipitation; thus, in the planning area high flows are observed during the spring and low flows are predominant from July through October. Below normal precipitation in the planning area from 1985 through 1992 and in 1994 has contributed to extremes in summer low flows. Naturally low summer flows, when combined with withdrawals for irrigation or other consumptive uses, can have a serious impact on other beneficial uses.

Timber management activities, such as road construction, harvest, and slash disposal, affect streamflow because they remove forest vegetation. Removal of forest vegetation reduces the amount of precipitation that returns to the atmosphere from interception and transpiration. More precipitation reaches the soil surface and drains into streams or becomes groundwater. Increases in streamflow can cause more frequent flooding, leading to decreased stream bank stability and increased movement of sediments.

The amount of streamflow increase resulting from removal of forest vegetation is proportional to the type of harvest, the area harvested within a specific watershed, and the time since harvest. Streamflow increases are most noticeable in small watersheds that have large areas of vegetation removed over a short time period. Streamflow increases in large basins tend to be masked, because the nonvegetated area is small relative to the size of the basin.

Increases in streamflow due to vegetation removal are not distributed evenly throughout the year. Summer streamflow increases result from greatly reduced transpiration which allows more water to drain through the soil to the streams. Increases in summer flows appear large when compared to the naturally low levels during the summer months. Summer increases are relatively short-lived because of the growth of vegetation along stream channels. Seasonal changes in streamflow following timber harvest are also linked to seasonal differences in soil water content between forested and harvested areas.

The duration of increased streamflow after removal of vegetation is not easily predicted; however, Harr (1983a) found that 27 years can be required for streamflow increases to disappear. The return of vegetation results in annual streamflows decreasing to preharvest levels as both interception and transpiration increase. Evaporation

from the soil surface is generally increased after timber harvest; however, this increase is offset by the reduction in transpiration.

The magnitude of peak flows can be increased by timber harvest in the transient snow zone, which is located at elevations where the snow level fluctuates in response to alternating warm and cold fronts. The transient snow zone in the planning area is generally between 2,500 and 4,500 feet. Snow accumulation is greater in clearcut openings than in undisturbed forests. Rain-on-snow events can result in rapid melting of the snowpacks in clearcut areas, resulting in more snowmelt being generated from clearcut openings and larger peak flows. However, timber removal is limited in its effect on the size of large peak flows, which cause extensive downstream flooding during heavy precipitation. When large peak flows (floods) occur during such heavy precipitation, the difference in soil moisture content between forested and harvested areas can become insignificant, and the hydrologic behavior of each area can become nearly identical. Soil disturbance can have an influence on the frequency and magnitude of small and large peak flows. The degree of influence depends upon the amount of area compacted by roads and tractor skid roads, and the proximity of the compacted area to stream channels.

The management of western juniper has increasingly become an issue, particularly as it relates to watershed health. Juniper can affect watershed health and function in several ways, particularly if it has "invaded" into areas that once were dominated by sagebrush-grass communities. Poor watershed health resulting from invasion of juniper has been attributed to reduced infiltration rates, increased surface erosion and sediment production, decreased water yield, and decreased soil surface cover. Precipitation falling on a juniper canopy is partially intercepted by the foliage, branches, and trunk (Bedell et al. 1993). The intercepted precipitation can be evaporated back into the atmosphere or it can flow down the limbs and trunk to the ground. The latter process, if in large amounts and if ground cover is lacking, can concentrate flow and cause rills to form on the soil surface (Bedell 1987). One report of water use by juniper states that a single tree with an 18-inch basal diameter can use up to 20 gallons per day in warm spring weather and up to 40 gallons per day on warm days in mid-summer (Bedell et al. 1993). The effectiveness with which juniper uses water can create a stressful environment for other vegetation when there is a limited moisture supply. The competition for water, light, and nutrients can result in a decline of the non-juniper plant community and reductions in soil surface cover.

The management, or treatment, of juniper can restore watershed health by designing treatment to improve specific watershed functions. However, the effectiveness of treatment will be highly variable based on site potential and the past, present, and future management of the site. It is a widely held view that, once juniper are "removed" from a watershed (cut, knocked down, or killed by fire or herbicides), there will be an increase in water yield. Water yield increases, though possible, are not assured. The vegetation that remains after treatment may increase in size, density, and cover after competition is removed and can use up any water "savings" realized (Pyke 1994). Conversely, there have been instances of increased flow from springs after removal of juniper around the spring source. Improvements in soil surface cover and infiltration and reductions in soil erosion will be influenced by site factors (soil texture, slope, aspect, amount of bare soil, and soil compaction) and by management of the site following treatment. Increased herbaceous cover can occur following treatment, some of which is contributed by annual plants. Perennial plants can also recolonize the site, if an adequate seed source exists and management promotes the recovery and retention of perennial plants. If perennial plants are to be reestablished on a site, prescribed burning may need to be foregone for eight to ten years, and grazing may need to be excluded or controlled on the site. Increased herbaceous cover can protect the soil surface from raindrop, increase infiltration and reduce erosion potential. An herbaceous cover can be encouraged by lopping and scattering limbs from treated trees or laying cut trees on the ground. This can improve the microclimate for reestablishing plants, provide physical protection from raindrop impact and livestock or wildlife use, make available the nutrients that are present in the juniper foliage, and reduce evaporation from the soil surface.

## Water Quality

Sediment, stream temperature, turbidity, dissolved oxygen, and chemical composition are important water quality components that indicate the level of protection of the beneficial uses within a watershed. The state's water quality requirements pertaining to BLM management practices in the planning area are the requirement for the highest and best practicable control of waste activities [Oregon Administrative Rules 340-41-965(1)], water temperature [Oregon Administrative Rules 340-41-965(2)(b)], turbidity [Oregon Administrative Rules 340-41-965(2)(c)],



coliform [Oregon Administrative Rules 340-41-965(e)], and the antidegradation policy (Oregon Administrative Rules 340-41-026). The Oregon Department of Environmental Quality is reviewing and proposing changes to its water quality requirements, of which several (the antidegradation policy, dissolved oxygen, temperature, coliform, and turbidity) relate to BLM land management practices.

Streams flowing from undisturbed forests generally have excellent quality. This characteristic makes streams valuable for domestic water supply, fish production, and recreation. Natural processes such as surface erosion, landslides, and flood events can increase sediments in stream channels, causing a detrimental effect on water quality.

**Units of Measurement.** Most chemical parameters of interest, as well as most sediment data, are reported in terms of concentrations, discharge, or yield. Water quality data is usually reported as concentrations or weight per unit volume, usually milligrams per liter or micrograms per liter. In generally high-quality waters, milligrams per liter equals parts per million, and micrograms per liter is equivalent to parts per billion. Sediment and chemical data can be expressed in terms of discharge (weight or volume per unit time, tons per day, or cubic feet per year) or yield (weight or volume per unit area of the watershed, such as tons per acre, acre-feet per square mile, or kilograms per hectare). Water temperature is measured in degrees Fahrenheit or degrees Celsius; turbidity is measured in Jackson or Nephelometric Turbidity Units; conductivity is measured in microsiemens, which are numerically the same as micromhos; and bacteria are measured in number of organisms per 100 milliliters.

**Stream Temperature.** Water temperature is one of the most important factors for survival of aquatic life. Most aquatic organisms are adapted to thrive within a limited range of temperatures. The primary concern with increases in water temperature is the potential for detrimental effects on fish and other aquatic organisms. Above-optimum water temperatures can be attributed to both natural and human-induced factors. Natural factors include low summer flows resulting from minimal to no precipitation during the summer, high summer air temperatures, wide channels, stream orientation, and geology.

Solar radiation is the main cause of increased water temperatures from management activities. Shade from riparian vegetation plays a major role in keeping streams cool. Stream temperatures may be affected if shading vegetation from stream banks is removed during timber harvest. Livestock grazing can cause water temperature increases by removal of stream-shading vegetation and the widening and shallowing of the stream channel by stream bank damage. These changes in the shape of the stream channel increase its surface area and its exposure to solar radiation. Because of its increased surface area, a wide, shallow stream will heat more rapidly than a deep, narrow stream. The color and composition of the streambed, the amount of water in a stream, the amount of sediments suspended in the water, and the direction that a stream flows all affect how fast and how much a stream may become heated. Because downstream shading does not significantly lower temperatures of streams warmed by upstream exposure, water temperatures of large streams also increase if small tributaries are exposed to solar radiation. The magnitude of this effect is dependent on the temperature and quantity of ground-water inflow, as well as inflow from other well-shaded tributaries.

**Sediment and Turbidity.** Sediment, or particulate matter, is described as suspended and settleable solids of organic and inorganic nature. Sediments occur naturally in water as products of weathering and erosion. Wind, water or frost action on rock surfaces result in the gradual breakdown of large, solid rock pieces into fine sand. Nutrients necessary to plant and animal life (iron, phosphorous, sodium, calcium) are transported as sediments, using rivers and streams as pipelines.

Erosion and sediment transport are natural processes that can improve as well as degrade streams and riparian areas within a watershed. Water erodes gravel banks to provide a continuing source of gravel for a stream, shifts gravel bars, and forms or deepens pools, all of which benefit spawning and rearing fish. However, erosion of fine-textured soils such as clays, silts, and fine sand can reduce habitat quality by filling in or smothering spawning gravels or by reducing water quality. This type of sediment can cause adverse effects when suspended in the water column or when deposited on the substrate. Some of the common measurements of sediment are turbidity, suspended sediment, settleable solids (wash load and bed load), and percent accumulated fine materials.

Suspended sediments are those carried in suspension. Rapidly flowing water can carry more suspended sediments than slow-moving water. As water flow slows, the largest particles settle to the bottom first. The lightest sediment particles are suspended the longest. Thus, clay particles, which are quite small, tend to stay suspended longer than sand particles. Suspended sediments can give water a murky or cloudy appearance by reducing light



penetration. Suspended sediment clouds water and can cause fin and gill damage in adult fish. Deposition of suspended sediment in lower gradient stream reaches (such as pools and slower moving streams) clogs interstitial spaces in cobble and rubble fish habitat and can reduce pool volume, which in turn lowers production of fish, macroinvertebrates, and most other aquatic life. Suspended sediment also increases the cost of treating drinking water. Chemicals, such as pesticides, and nutrients often bind to sediment particles, thus they can be retained in the stream system rather than being flushed downstream. Too many suspended sediments can block or reflect sunlight before it reaches aquatic plants. Heavier sediments can cover leaves, inhibiting photosynthesis, or even bury plants.

Turbidity is the measurement of the optical property which causes light to be scattered and absorbed. Turbidity is commonly measured in Jackson or Nephelometric Turbidity Units. There is no direct relationship between the two methods; therefore, there is no direct method of converting Jackson or Nephelometric Turbidity Units or vice versa. Turbidity can impair salmonid sight-feeding ability, reduce growth in salmonids, decrease primary productivity by reducing light penetration, and can contribute to an increase in stream temperature due to increased absorption of radiant energy.

Water quality requirements are usually set in turbidity units rather than in terms of sediment amounts. The general criteria established by the Environmental Protection Agency is that "settleable and suspended solids should not reduce the depth of the compensation point for photosynthetic activity by more than 10 percent from the seasonally established norm for aquatic life" (Environmental Protection Agency 1986). Chapter 340 of the Oregon Administrative Rules sets a standard of no more than a 10 percent cumulative increase in natural stream turbidities to be allowed, as measured relative to a control point immediately upstream of the turbidity-causing activity.

Bedload sediments are too heavy to be constantly suspended. They are rolled and bounced along the bottom of a stream. The size of a particle of bedload sediment will vary with the volume and speed of the water. Instream sediment levels, including bedload sediment, are both transport (flow) and supply dependent. Paustian and Beschta (1979), Jackson and Beschta (1982), and VanSickle and Beschta (1983) described bedload transport in terms of supply of material available for transport at various levels of flow; they found that most bedload transport occurred during short periods of high water, when flows were sufficient to entrain coarse, armoring riffle sediments, and access supplies of finer material within the riffle. Subsequent studies (Jackson and Beschta 1983) have demonstrated that increased amounts of sand in transport can cause previously stable, coarse riffle sediments to undergo scour. Stream bank erosion can also be a result of these peak flows. Increased high flow events can cause increased sediment concentrations and more frequent episodes of riffle scour and fill.

The effects of management activities on sediment transport are directly related to the effects on high flow events. The effect of management activities on the supply of sediment available for transport depends on the average slope of the sediment contributing area and the type of erosion processes dominant in the area of the activity. On gently sloping topography with competent (erosion resistant) bedrock, little, if any, increased erosion can be expected (Harr et al. 1979) as a result of management activities. On steeper slopes, surface erosion (known as dry ravel) occurs, especially after slash burning. It is not known how much of this eroded material reaches streams and becomes sediment.

Soil erosion is the main source of sediment in water. Some soil is eroded naturally through the weathering processes of rain and wind. However, the main causes of soil loss are agricultural practices, timber harvesting, road and building site construction, livestock grazing, and mining activities. Harr et al. (1979) reported that mean annual suspended sediment concentration in a clearcut watershed, without roads, was about nine times the natural concentration (in an undisturbed forest), and mean annual sediment concentration in a patchcut watershed, with roads, was about 23 times the natural concentration.

Timber management (road construction, timber harvest, and slash disposal) and other ground disturbing activities can affect sediment levels in streams by increasing the capacity of the streams to entrain and transport sediment and by increasing the supply of sediment available for transport. Increases in peak flows have a direct relationship to increases in sediment transported downstream. Forestry practices can also influence the sediment entering streams through surface erosion or landslides. This influence is dependent on natural rates of surface erosion and landslide frequency, climatic factors, and the type of activity. Timber harvest operations can damage stream banks, remove vegetation with roots that strengthens streambanks, widen stream banks, and lower

surface water levels during low flow conditions. In areas where debris avalanching is the dominant erosion process, clearcutting has increased the natural rate of avalanching 2 to 4 times, and road building has increased the natural rate of erosion as much as 25 to 340 times (Harr et al. 1979).

Roads continue to be a major source of stream sedimentation, although over the past 10 years improved methods for design, location, construction, and resurfacing dirt roads with rock have greatly reduced the amount of sediment contributed by roads. Surface erosion from cut and fill slopes, road surfaces, stream crossings, and drainage ditches can result in a continuous sediment source for nearby streams. Road construction can increase erosion as much as 250 times in the first storms following construction, however concentrations usually drop off between a few months and two years (Brown 1983). More extended periods of increased sediment can be associated with heavy truck road use during very wet weather, on poorly surfaced roads, or with unauthorized off-highway vehicle use.

Roads that encroach on stream channels permanently alter their flow characteristics by diverting or constricting the channel. Increased water velocities associated with constriction frequently lead to accelerated channel erosion. Road maintenance can remove riparian vegetation and disturb ditches and cutbanks that have been stabilized by vegetative ground cover. Skid roads, if located near streams, can contribute sediment if not properly waterbarred, seeded, or obliterated after use.

Livestock grazing can alter water quality by changing hydrologic conditions within a given watershed, primarily those of surface cover and soil infiltration rates. Ground cover and the area of exposed soil can have the greatest influence on surface runoff, soil erosion, and pollutant transport. Moderate to heavy grazing by livestock can decrease infiltration rates and increase surface runoff, soil compaction, soil erosion, and sediment yields. More localized impacts of grazing on water quality result from stream bank sloughing (the collapse of stream banks) and the subsequent sediment that enters the stream channel.

Mining activities can disturb large tracts of land, which can contribute to sediment problems. In addition, placer mining can involve removal of stream bank vegetation and the channelization of streams which can contribute great quantities of sediment to the channel.

**Chemicals and Nutrients.** Nutrients enter water mainly from treated municipal sewage discharges, failing septic tank systems, livestock operations (grazing or feed lots), and from fertilizers washed into the water by rain or irrigation. Excessive amounts of nutrients released into slow moving waters during spring and summer can result in growths of algae and aquatic weeds. Algae blooms reduce the amount of oxygen available to fish, which can result in fish kills. Shallow, nutrient-rich lakes often have impaired recreational and aesthetic values. The Water Resources section in Chapter 3 discusses the upper Klamath River and the issues associated with nutrients in that water body.

To address the problem of algae growth, the Oregon Environmental Quality Commission adopted a chlorophyll standard. The amount of chlorophyll in water indicates the amount of aquatic plant growth. Waters violating this standard will be studied by the Environmental Quality Commission to determine the nutrient sources and options for controlling the problem.

Lakes undergo a natural aging process, which can be accelerated by human activities. This is especially true for lakes that are "old" in their stage of development, which means they have high nutrient levels and are more marsh-like. Improper agricultural, forestry, and other land use practices cause soil erosion that can introduce sediment and nutrients into the lake. This sediment can eventually fill a lake or reservoir, while nutrients could increase the frequency of algal blooms and accelerate aquatic weed growth.

Timber harvest and slash disposal can affect the nutrient status of surface water. Clearcutting can disrupt the tight nutrient cycling of an undisturbed forest system, resulting in an accelerated breakdown of forest litter from increased temperatures and water content of the site. Once trees are removed they are no longer using the available nutrients, which can then enter surface waters through leaching or soil erosion. Slash burning can accelerate this process by making additional nutrients available for transport through volatilization and ashfall of organic material. In one Oregon Cascades watershed, instream concentrations of ammonia nitrogen and manganese reached peak levels of 7.6 and 0.44 milligrams per liter respectively following slash burning (Fredriksen

1971). Fredriksen attributed the high concentrations of ammonia nitrogen and manganese to burned slash in stream channels. However, the levels of these nutrients in streams rarely exceeds or approaches standards for those nutrients (Fellers and Kimmins 1984, Harr and Fredriksen 1988).

The aerial application of herbicides is another management activity that can affect the chemical water quality of streams. A detailed discussion of potential water quality impacts of herbicides proposed for use by the BLM can be found in the Final Environmental Impact Statement for the Western Oregon Program for the Management of Competing Vegetation (BLM 1989).

Application of nitrogen fertilizers also affects the chemical water quality of streams. Nitrogen is usually added to the soil by aerial application of urea pellets. Since direct fertilizer application is the major pathway for urea entry to streams, concentrations usually peak within one to two days following fertilizer treatment. Ammonia nitrogen also usually peaks shortly after treatment because it is a hydrolysis product of urea entering the stream.

Ammonia nitrogen in the soil is held very tightly, while nitrate nitrogen is readily leached from the soil. Leaching usually occurs after ammonia is oxidized to nitrate during the warm growing season. Therefore, peak nitrate concentrations are often recorded one to two years after fertilization. On the other hand, if nitrogen fertilizer is applied shortly after an area has burned, the warm soil temperatures can enhance nitrification and subsequent leaching of nitrate to the stream. Moore (1975) summarized several water quality monitoring studies on forest fertilization with urea throughout the Pacific Northwest and found maximum recorded nitrate values were usually less than 1 milligrams per liter and in all cases were less than 5 milligrams per liter.

Ammonium-based fire retardants can adversely affect water quality. Studies have reported initial retardant concentrations in water approached levels that could damage fish. Concentrations decreased sharply with time after application and distance downstream (Norris and Webb 1989).

Natural background phosphorus in streams is contributed through leaf fall and other organic material, ground water leaching, and soil eroded into streams. The use of fertilizers, fire retardants, and herbicides can, in some instances, produce small and short-term increases in stream water phosphorus concentrations. Most published studies indicate that forest management activities have only limited, if any, effects on instream phosphorus levels (Salminen and Beschta 1991).

Dissolved heavy metals found in waters polluted by mine drainage are toxic to the aquatic biota. Toxic metals commonly released by mining are arsenic, cadmium, cobalt, copper, iron, lead, manganese, mercury, nickel, and zinc. Synergistic toxicity is common in waters polluted by heavy metals from mining (Martin and Platts 1981).

**Dissolved Oxygen.** Oxygen is as essential to life in water as it is to life on land. Oxygen availability determines whether an aquatic organism will survive and affects its growth and development. The amount of oxygen found in water is called the dissolved oxygen concentration and is measured in milligrams per liter of water. Dissolved oxygen levels are affected by altitude, water agitation, water temperature, the types of numbers of plants in the water, light penetration, and the amount of suspended sediments. Water absorbs oxygen from the atmosphere and the mixing of air and water in turbulent stretches of a stream both add significant amounts of oxygen to water.

Temperature directly affects the amount of oxygen in water—the colder the water, the more oxygen it can hold. Warming of water will cause reductions in dissolved oxygen levels. Oxygen can also be added to water as a result of plant photosynthesis. If photosynthesis is inhibited by sediments either by making the water murky or by burying leaves, then the plants will add less oxygen to the water. Instream concentrations of dissolved oxygen can be reduced by excessive amounts of organic debris entering streams during timber harvest. Once this organic material enters the channel, it can adversely affect dissolved oxygen concentrations in several ways: by exerting an increased biochemical oxygen demand; by restricting flow, reducing aeration, and by accentuating water temperature increases (Ponce 1978). When fine organic debris, such as small twigs and needles, is left in a stream, the contained sugars and phenols are leached out. The degradation of these materials by microorganisms present in the stream is a process of simple oxidation. Organism growth and metabolism create an increased oxygen demand, and oxygen concentrations decrease as demand exceeds supply (Ponce and Brown 1974). Too much fine organic debris in the stream can deplete dissolved oxygen concentrations at critical times of high stream temperatures, low flows, and low available oxygen. Most of the increased biochemical oxygen demand occurs within about 20 days of the time the material enters the stream (Ponce 1978).



**Bacterial Contaminants.** Bacterial contaminants most likely to be introduced into water bodies through natural processes and management activities (such as grazing and dispersed recreation) are total and fecal coliform, and fecal streptococcus. Concentrations of fecal contamination are important indicators of potential health hazards for domestic water supplies and water-contact recreation. Fecal contamination does not directly affect suitability of fish habitat, however, it can promote algal growth, which affects both fish habitat and the appearance of water. Levels of fecal coliform bacteria are known to increase in surface waters with the presence of livestock. Factors controlling the severity of fecal bacteria pollution and inputs of nutrients include the number of livestock, closeness of grazing to surface water, and the surface runoff conditions on areas being grazed. Bacterial concentrations tend to reach their peak during summer months when low flows combine with high recreation and livestock grazing use.

**Macroinvertebrates.** Macroinvertebrates are those invertebrates that can be detected with the unaided eye. Macroinvertebrates in the aquatic environment provide a link in the food chain between microscopic, multi-celled organisms and fish populations. They are essential to the growth and production of fish and because of their strict habitat requirements, are very useful indicators of aquatic habitat changes. The number, size, and species of aquatic invertebrates are important to fisheries habitat, as they are the primary food source for most salmonids and warm-water fish (Cooper et al. 1988).

A healthy stream usually has a rich and varied range of macroinvertebrates, while streams with poor water quality will have just a few different species. The diversity of macroinvertebrates is important, but the types of organisms can also indicate water quality. Other factors also influence the type of aquatic organisms that can be found in the stream. Each organism has needs for habitat and food; if the stream does not have either, then the organism cannot live there. For example, some aquatic organisms feed on leaves or other organic material, others filter out small particles from the water, some scrape algae off of rocks, and some are predators that feed off of other macroinvertebrates. Also, some aquatic organisms attach to rocks, while others live in vegetation. If a macroinvertebrate is not found in an area where it has food and habitat available, then poor or stressful water quality conditions may be present.

The effects of forest management activities on macroinvertebrate communities vary. Increases in the riparian canopy opening or the amount of organic material in the stream generally enhance aquatic insect populations. An increase in fine sediment usually has the opposite effect. Removing the riparian canopy decreases the input of terrestrial organic material and the number of detritivores. However, this decline often is overwhelmed by the corresponding increase in primary production and herbivorous insects (Environmental Protection Agency 1991).

Macroinvertebrates, particularly benthic macroinvertebrates, have several characteristics which make them useful as indicators of water quality: they have either limited migration patterns or a sessile mode of life, which makes them suitable for assessing site-specific impacts; their life span (several months to several years) is long enough to be able to be used as indicators of past environmental conditions; and the sensitivity of aquatic insects to habitat and water quality changes often make them more effective indicators of stream impairment than chemical measurements (Environmental Protection Agency 1991).

Aquatic macroinvertebrate monitoring is a useful tool for evaluating general water quality condition and the extent to which designated uses are impaired or supported. To be most effective and reliable, however, biological studies need to be integrated into a monitoring plan that includes both physical and chemical evaluations.

For additional information regarding water resources see *Monitoring Guidelines to Evaluate Effects of Forestry Activities on Streams in the Pacific Northwest and Alaska* (U.S. Environmental Protection Agency 1991), *Study and Interpretation of the Chemical Characteristics of Natural Water* (U.S. Geological Survey 1990), and *Monitoring Protocols to Evaluate Water Quality Effects of Grazing Management on Western Rangeland Streams* (U.S. Environmental Protection Agency, 1993).

## Riparian-Wetland Areas

**Riparian-Wetland Area Function.** Riparian-wetland areas are critical to the regulation of stream flow and to water quality protection. Riparian areas in good condition serve many functions. Healthy riparian vegetation can

provide hydrologic benefits through water quality enhancement, attenuation of flood peaks, erosion control, and increased storage of water in stream banks. Vegetation growing in the riparian area can improve water quality by filtering out sediments and nutrients from flood flows. When plants reduce water velocity, sediments drop out of water, which builds up floodplains. Plants grow in this new sediment and their roots bind the sediment together to hold stream banks when high flows from storms or floods occur. While riparian trees and shrubs can evapotranspire more water over the course of a year than might evaporate from bare soil, the hydrologic benefits of this vegetation can far outweigh considerations of water use. Woody species often provide local channel stability and resistance to erosion so that other species (sedges, rushes, grasses and forbs) can become established (Elmore and Beschta 1987). Alluvial riparian-wetland areas can function as shallow aquifers that recharge during high flows and drain during low flows. This interaction between surface flow and groundwater storage results in moderated high flows and enhanced or prolonged base flows. Summer flows have improved in a variety of streams in eastern Oregon where riparian vegetation has been allowed to flourish and stream channels have begun to aggrade. The slow release of water from increased subsurface storage can more than offset the amount used by riparian-wetland vegetation (Elmore and Beschta, 1987).

**Geomorphology of Riparian-Wetland Areas.** Stream riparian-wetland areas have important geomorphic and hydrologic components that support their high level of biological productivity and provide habitat. The most productive stream riparian-wetland areas are often associated with alluvial stream systems. These components include wet soils and instream structural features, such as pools, riffles, gravels, and stream banks. The vegetation that thrives in riparian-wetland areas contributes to their proper geomorphic and hydrologic functioning. Disruption of normal geomorphic or hydrologic function, or the vegetation on which it depends, usually results in impairment of overall riparian resource values.

Geomorphic and other disturbance processes affect the spatial pattern and successional development of riparian vegetation (Gregory et. al 1991). Geomorphic processes that modify riparian-wetland areas operate on time scales ranging from chronic (months to years) to episodic (decades to centuries) and on spatial scales ranging from localized shifts in channel position involving a specific reach to basin-wide flooding. In addition to fluvial or erosional events that create new geomorphic surfaces, sediment deposition and battering during floods cause less severe but more frequent damage, which may influence vegetative succession (Gregory et. al 1991). The distribution and composition of riparian-wetland plant communities reflect the histories of both fluvial disturbance from floods and the nonfluvial disturbance regimes of adjacent uplands, such as fire, wind, plant disease, and insect outbreaks. Stream channel characteristics change as surrounding vegetation develops through various seral stages, starting with the early seral stage and ultimately developing into a mature stand of climax vegetation.

Geomorphic structure, such as pools and flood plains, strongly influences stream and riparian ecosystems. This is particularly true in steep, mountain valley floors typical of the Coast Range and western slope of the Cascades where floods and debris flows can (over a few years or decades) damage riparian vegetation and alter aquatic habitats.

The frequency and extent of disturbance, accessibility of riparian-wetland areas to wildlife, and magnitude of vegetation influence on stream ecosystems varies as a function of drainage area and stream channel and valley floor widths. Another important source of structural variability along streams are bedrock outcrops and large hillslope landslides. Areas of very narrow valley floors can occur along headwater channels in V-shaped valleys or in bedrock or landslide-controlled gorges along larger channels. Such areas can have extensive topographic shading and little riparian habitat. In wider valley floors channels can move laterally, creating complex mosaics of vegetation and secondary channels rich in aquatic and terrestrial habitat. If only fluvial processes have formed valley floor landforms and there has been no significant influence from variation in bedrock hardness, hillslope landslides, or other exogenous factors, valley floor and channel widths are likely to increase uniformly in the downstream direction. Channel and valley floor conditions can vary greatly from one geologic terrain to another (Hansen et al. 1988).

**Stream Order and Riparian-Wetland Areas.** On the west side, there is often a strong correlation between stream order and riparian-wetland area conditions. The stream order system categorizes unbranching headwater stream channels as first order streams; the joining of two first order streams creates a second order stream; two second order streams combine to form a third order stream, and so forth. There is no perfect correlation between stream order and stream characteristics in the planning area, but some generalizations can be used. In general,

first and second order streams in the planning area exhibit ephemeral or intermittent flow and are usually dry during the summer. These streams are influenced by the geomorphology, soils, and vegetation of their channels and are usually continuously shaded by vegetation due to narrow channel width. Woody debris and streamside vegetation act as energy dissipators on these steeper gradient headwater streams. These streams can have a major influence on the type and quality of downstream fish habitat because they comprise approximately 70 to 80 percent of total stream miles in western Oregon (Boehne and House 1983).

Third and fourth order streams can flow year-round although many are intermittent. They are narrow enough so that streamside vegetation provides continuous shade. Stream gradients can be steep, but not as steep as in first and second order channels. During winter storms, these streams are capable of moving large amounts of sediment, nutrients, and woody material downstream to higher order streams. Woody material in the channel usually provides habitat for resident fish.

The direct influence of riparian-wetland areas is moderated in fifth order and larger streams but remains important. Channels tend to be wider and have flatter gradients than the lower order streams. Canopies of large, old growth trees provide some shade; vegetated riparian-wetland areas keep the main channel confined; and large tree stems remain in the stream to provide important fish habitat. Flood plains of larger streams contain multiple side channels, overflow channels, and isolated pools. Side channels are often created and maintained by large woody debris (Blisson et al. 1987, Sedell et al. 1984). Alluvial material and woody debris can be deposited in quiet areas, but accumulations are flushed and rearranged during high flows (Sedell et al. 1988).

**Biology.** Riparian-wetland areas are commonly used as corridors for movement of animals within drainages, but they also play a potentially important role within landscapes as corridors for dispersal of plants (Gregory et al. 1991). Riparian-wetland areas also significantly affect interactions between upland and aquatic ecosystems through modification of microclimate (light, temperature and humidity), alteration of nutrient inputs from hillslopes, contribution of organic matter to streams and floodplains and by retention of organic matter and sediment. A buffer zone of three or more tree heights (approximately 400 to 500 feet) is required to protect streamside riparian-wetland areas from changes in microclimate and wind damage that can threaten the integrity of vegetative structure, species composition, and wildlife values (Oregon Department of Fish and Wildlife 1991). Microclimate impacts to riparian-wetland areas include increased water temperature from solar radiation and from elevated air temperatures contacting water surfaces. Water temperature increases of up to 20 degrees Fahrenheit have been documented in western Oregon (Levno and Rothacher 1969). Another microclimate change is caused by reduced humidity, which can cause compositional changes in vegetative species. This can alter a food chain based on decaying leaves and benthic invertebrates, which has potential impacts to fisheries.

Riparian plant communities provide an abundant and diverse array of food resources for both aquatic and terrestrial consumers and organic material and inorganic sediment retained within a stream can serve as nutritional resources or habitats for aquatic organisms (Gregory et al. 1991). Riparian vegetation affects the abundance and community structure of macroinvertebrates and other aquatic organisms in the stream. These organisms, in turn, provide a food base for fish. For example, subterranean invertebrates thrive in a maze of channels that flow among the gravels, sands, and rock that underlie many streams and rivers. These underground waterways can be as deep as 30 feet and can extend sideways for miles from the stream channel. In this understream area, called the hyporheic zone, live small blind shrimp, primitive worms, bacteria, algae, and various immature insects. These underground animals support a food chain that extends to the surface. The hyporheic zone serves as a refuge for creatures during times of drought, stress, and/or floods. After such events, streams can rely on the underground life to assist in repopulation of aquatic invertebrates. The underground system is rich in bacteria that fix nitrogen, which is in great demand by surface organisms.

**Management Activities In Riparian-Wetland Areas.** Timber management activities (road construction, timber harvest and slash disposal) can remove riparian vegetation, constrain natural stream channels, and alter stream banks and channel structures at stream crossings. Debris torrents, often caused by clearcut timber harvesting techniques and/or by road construction in very steep terrain, can scour stream beds down to bedrock, damage riparian vegetation, and eliminate the ability of riparian-wetland areas to store water as shallow aquifers. It is sometimes necessary during timber harvests to yard logs through riparian-wetland areas; this can cause damage to riparian vegetation and stream banks. Timber harvests can also result in long-term reductions in the amount and size of large woody debris, and both large and fine organic matter, that enter a stream channel. Replacement



of large woody debris in riparian-wetland areas following timber harvest is a slow process, which depends on the following: the volume of pre-harvest woody debris that remains in the channel following logging and the rate at which it decomposes or is transported from the site during freshets; the volume of debris that enters the channel during logging and is not removed; the rate at which the riparian zone progresses through site-specific seral stages and; the frequency of additional periodic disturbance at the site, including the number and diameter of trees removed. Following timber harvest or other site disturbance, at least 120 years can be required for stream-side riparian vegetation to return to woody debris levels (amount of wood with sufficient length and volume) that approximate stream channel conditions in undisturbed timber stands (Heiman 1988). Full recovery can take at least 200 years (Franklin et al. 1981). Changes in species composition and vegetative structure can be permanent if the area is subjected to additional periodic timber harvest. Timber harvest on private and public lands throughout the planning area has fragmented the few stands of stream-associated riparian habitat that remain undisturbed by management activities.

The physiological needs of riparian vegetation are generally not met in standard livestock grazing systems. Improper livestock grazing methods can reduce stream side vegetation, which allows erosion to begin. Cattle tend to concentrate in riparian-wetland areas if: water is not well distributed in their grazing pasture; the land near the riparian-wetland areas is steep or rocky; salt is placed in or near riparian-wetland areas; the weather is hot and the riparian area provides shade; upland forage is less palatable than riparian forage; the herd is composed of cows with calves as opposed to yearlings; individual animals develop behavior patterns that favor riparian-wetland areas; animal distribution is not maintained by herding; and/or the grazing season is long. The effects of livestock grazing vary by season. In spring, upland forage is palatable and water more available. This can reduce riparian use. However, cattle that do use riparian areas in spring can cause physical damage to stream banks and meadows by compacting the moist soils or shearing off stream banks with their hooves. Cattle use of riparian areas generally increases as the summer progresses. It reaches a peak during periods of prolonged drought or intense heat. In late summer, forage preference switches to include more shrubs. When fall rains moisten dry forage and create green up on uplands, or cold weather creates frost pockets in riparian areas, cattle again disperse.

Some damage to riparian areas occurs from the normal erosion processes of the stream. However, when riparian vegetation becomes too stressed, it can no longer hold together the stream banks or prevent bank erosion. A stream may then cut through its meanders, which shortens the length of the stream and increases the velocity of the water. If too many meanders are cut, the faster moving water has more power to erode its channel and will likely begin to cut deep into the floodplain of sediment that has been building over time. Soon the water is deeply confined in a straight channel and cannot reach the old floodplain, even during floods. Channelized streams can carry tremendous sediment loads as they erode away the banks of their new, unprotected channels.

As erosion progresses and water tables lower, the riparian vegetation that dependent on a high water table soon dries out. The water-dependent vegetation is replaced with plants that can survive in drier sites. For example, lush sedges and meadow grasses can be replaced with sagebrush and rabbitbrush. The water storage capacity of the riparian area is reduced or lost, and more "flashy" (extreme high and low) flows can occur. The stream channel will become wider and shallower, and the eroding stream banks will become higher as the stream channel bottom lowers in relation to the floodplain.

Riparian habitats require more intensive management to protect their values than the adjacent upland areas. Concentrations of livestock along streams can cause stream bank sloughing, loss of riparian vegetation, and loss of aquatic productivity. Use of riparian vegetation by livestock too early in the season can result in stream bank hoof shearing. When livestock grazing begins during spring runoff the season's vegetative growth could be inadequate to protect stream banks and filter sediment. Grazing in riparian-wetland areas, when soil moisture is greater than ten percent, can damage banks and cause soil compaction, impairing growth of the riparian vegetation. However, early season use provides more opportunity for regrowth and plant recovery than summer or fall use. Regrowth is important in sustaining the important physical functions of a riparian system (shading, insulation, sediment filtering) and for buffering the effects of peak runoff on stream banks. Use by livestock later in the season can leave streamside vegetation depleted and banks vulnerable to damage during the following spring runoff. Utilization of willow by livestock before carbohydrate storage is complete can be detrimental to willow growth and regeneration. Strict grazing system compliance must be obtained when managing for recovery in

riparian-wetland areas. A few cattle remaining in a pasture after the prescribed use period can negate the benefits of a good system. Stray animals invariably spend the bulk of their time in stream bottoms (Meyers 1989).

## **Groundwater**

Water that infiltrates the soil surface is known as groundwater. Most groundwater eventually discharges into stream channels, although some groundwater is found in layers called aquifers (water-bearing rocks or sediments that occur at depths from a few feet to several hundred feet below the surface). There are two types of aquifers: unconfined (also known as water table aquifers) and confined (also known as artesian aquifers [see Figure P-1]). Unconfined aquifers are generally shallow with an impermeable layer of rock or soil defining the lower boundary. The water table (saturated zone) is located between the impermeable layer and land surface. These shallow, unconfined aquifers are prone to contamination from surface pollutants. Confined aquifers are very deep below the soil surface and are separated from the surface by an impermeable layer of rock or soil. The quality of water in confined aquifers is generally excellent; however, in some cases, chemicals in the subsurface geologic formations can add undesirable contaminants, such as arsenic, boron, or sodium.

Groundwater is replenished by rain and snow, which filters through soil and geologic formations. This underground water generally moves slowly from mountains and uplands to lowlands and valleys, where it is discharged to creeks, rivers, and marshes, and provides the base flow for streams throughout Oregon. The discharge can vary significantly in different areas, depending on the nature of the aquifer.

Vegetation can influence groundwater in one of two ways. The presence of an abundant vegetation cover can decrease the amount of water stored in the soil through evapotranspiration. Conversely, vegetation can help the groundwater table to rise by improving infiltration and by reducing surface runoff. Water tables can rise after removal of vegetation due to increased water (from reduced transpiration) recharging groundwater areas. This effect can be negated by the reduction in the amount and rate of infiltration from removal of soil surface cover and by disturbance during treatment of vegetation. Reductions in groundwater can also occur when subsurface flow is intercepted by roads built in conjunction with vegetation management. Road cuts intercept precipitation and transport it as surface water through a ditch-culvert system. Some of this water is deposited on undisturbed soil areas where it returns to subsurface flow. The remainder is deposited into channels where it becomes streamflow.

## **Cumulative Watershed Effects Analysis Procedure**

The following is a description of a method for analyzing cumulative watershed effects. The methods used in the planning area to conduct cumulative watershed analysis will be continuously revised and updated based on new information and improved methods for assessment.

Cumulative watershed effects analyses are performed on a project level for individual timber sale environmental assessments. The analysis area for this level will generally be 3rd to 5th order watersheds (approximately 2,000 to 10,000 acres). Existing watershed condition is determined by developing a management history for all land within the watershed being analyzed, regardless of land ownership or administrative boundaries. Three types of hydrologic analyses may be performed when evaluating cumulative watershed effects: determination of equivalent clearcut area, compacted area, and the extent of openings in the transient snow zone.

The calculated equivalent clearcut area value represents the total acreage within the delineated watershed considered to be in a clearcut condition in terms of hydrologic response. The equivalent clearcut area includes the area of clearcuts and roads plus an equivalent clearcut area for partial cuts, overstory removals, selective cuts, and commercial thinnings. Treatment factors are used to convert non-clearcut harvested acres to equivalent clearcut acres.

Forest harvest activities can result in soil compaction (in the form of roads, tractor skid trails, and cable corridors), affecting the hydrology of a watershed by significantly reducing infiltration and increasing surface runoff. The compacted area is calculated for BLM-administered land (based on road miles and acres harvested by each yarding system) and estimated for non-BLM land.

The transient snow zone is where shallow snowpacks accumulate and then melt throughout the winter in response to alternating cold and warm fronts. In the planning area, this zone is generally found between 2,500 and 4,500 feet elevation. However, most of the planning area is located at elevations greater than 4,500 feet, so this phenomenon does not have a great influence on hydrology, except for some watersheds located in the southern portion of the planning area. Created openings, from a hydrologic point of view, are related to the stand structure and its influence upon the accumulation and melt of snow in the transient snow zone. A created opening is considered fully recovered when there is 70 percent canopy closure and the average stem diameter of young trees is eight inches in diameter at breast height. The area in the with nonrecovered openings is calculated for each harvest type.

An evaluation of the existing watershed condition and channel stability and condition is then done to determine if past timber harvest activities have affected the magnitude of peak flows or sediment yields. Once a relationship between existing watershed condition and stream channel condition has been established, any proposed actions can be evaluated for their potential to cause degradation in stream channels, increase the magnitude and frequency of peak flows, and add to sediment yields.

The extent to which any or all of the following criteria exist will determine which watersheds are identified to receive special management attention. These criteria are not listed in any priority order: highly erodible soils; high equivalent clearcut area; high compacted area; high non-recovered openings in the transient snow zone; high sedimentation potential; poor to fair channel stability or condition; poor to fair riparian condition; high effects from past catastrophic events; high road density; potential for negative effects on a beneficial use; monitoring data that shows water quality does not meet state water quality requirements. Further evaluation of the watershed can be needed, including gathering monitoring data to validate the conclusion of the effects analysis and to establish baseline data.

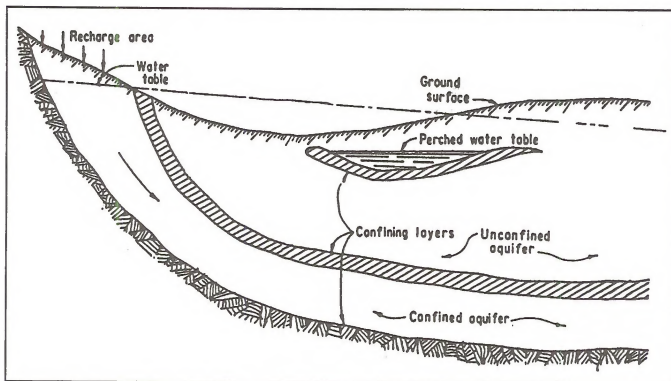
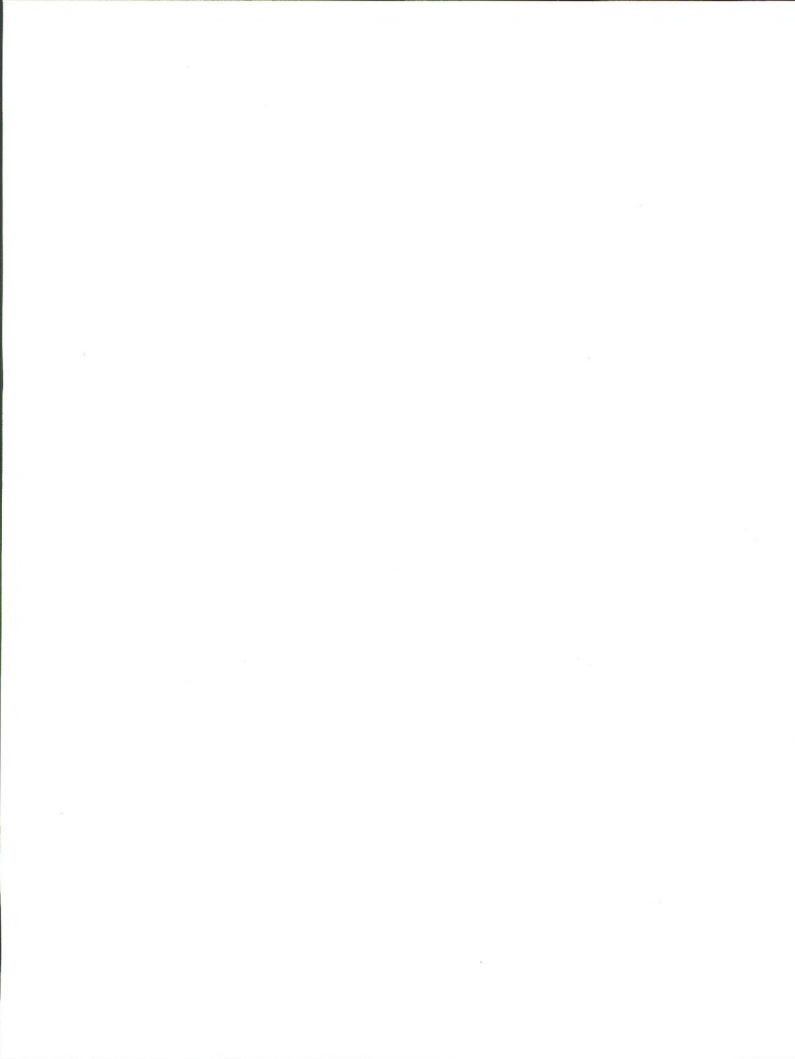


Figure P-1. Groundwater system relationships (source: U.S. Bureau of Reclamation).



# Appendix Q

## Fisheries

### Introduction

This appendix consists of two sections: Fish Species in the Klamath Falls Resource Area and Stream Habitat Quality Rating. The first section lists the major fish species found in the streams and lakes of the Klamath Falls Resource Area. The second section describes the process used in rating the quality of stream habitat.

### Fish Species in the Klamath Falls Resource Area

#### Salmonid

Rainbow trout  
Cutthroat trout  
Brown trout  
Brook trout  
Redband trout

#### Nonsalmonid

Lamprey *lampetra* spp.  
Blue chub  
Tui chub  
Dace *Rhinichthys* spp.  
Shiners *Richardsonius* spp.  
Bullheads *Ictalurus* spp.  
Yellow perch  
Sacramento Perch  
Sunfishes *Lepomis* spp.  
Fathead minnow  
Sculpins *Cottus* spp.  
Lost River sucker  
Shortnose sucker  
Klamath largescale sucker  
Klamath smallscale sucker  
Jenny Creek sucker  
Crappie *Pomoxus* spp.  
Largemouth Bass  
White sturgeon

### Stream Habitat Quality Rating

The rationale for using riparian tree size (diameter at breast height) to rate stream habitat quality is based on research (Sedell et al. 1988), inventory data, and the field experience of BLM fishery biologists. Data from these sources indicates that vegetative conditions (size of trees) in adjacent riparian zones are directly related to stream habitat quality and fish populations. Trees in riparian zones fall into streams and create desirable habitat conditions. Tree size information is available in the BLM Operations Inventory and was used for making the initial stream habitat quality rating.

#### *Appendix Q - Fisheries*

A "related factors" analysis was done to determine if other factors should be considered in making a final habitat quality rating. There are many interrelated physical and biological factors that affect the quality of fish habitat and fish populations. In addition to tree size in riparian zones, other factors include amount of water diversion, amount of sediment yield, availability of natural structure, presence of beaver dams or side channels, and/or presence of rehabilitation structures. Some of these factors are not inventoried for all BLM stream segments; therefore, the district biologist determined which of the known factors were most important in making a final habitat rating.

In the Klamath Falls Resource Area other factors were considered. In many areas the riparian zones did not contain trees through natural conditions. Some riparian zones contain deciduous trees whose diameters seldom reach 21 inches. In these areas the stream condition was based on Oregon Department of Fish and Wildlife and BLM biologist's opinions.

On the east side no riparian analysis was completed. Therefore, all stream conditions were based on biologist's opinion.

Using the initial rating based on tree size and the related factors analysis, conditions of all streams were rated as minimal, fair, or good/optimal (see Table 3-21).

The characteristics of the condition classes are as follows:

**Minimal.** Major alterations in watershed, water quality and quantity conditions, natural stream habitat and riparian zones; few or no large trees present in riparian zones, with most trees between zero and eleven inches diameter at breast height; little or no large woody debris; pools few and shallow; heavy sedimentation of streambed by sand and silt; stream productivity for aquatic life drastically reduced, fish populations between ten and twenty-five percent of potential.

**Fair.** Watershed moderately impacted by activities; riparian vegetation altered by past events or activities, few large trees present, with most trees between eleven and twenty-one inches diameter at breast height; physical stream conditions substantially altered from natural conditions because of past or present activities, such as limited amounts of large woody debris and fine sediments in pools and riffles; some adverse changes in water quality and quantity; habitat either partly recovered or still decreasing in trend; stream moderately productive for aquatic life, but fish populations far below potential (approximately fifty percent).

**Good/Optimal.** Watershed either not greatly impacted by activities or mostly recovered; riparian zones have diverse vegetation, including large trees over twenty-one inches diameter at breast height; physical stream conditions only slightly altered, with nearly complete recovery or virtually unchanged from natural conditions (abundant and diverse instream structure including large woody debris, numerous deep pools, bottom substrate relatively free from fine sediments, adequate spawning gravels, and stable banks and channels); water quality and quantity (such as temperature, turbidity, and flow) generally unaltered from natural conditions; stream highly productive for aquatic life, producing at or near its potential for salmon, trout, and other native fishes.



# Appendix R

## Cultural Resources

### Introduction

This appendix describes the basic procedures and inventory classes used in cultural resource management. The BLM's standard cultural resource program consists of the three classes of inventory described below.

### Cultural Resource Inventory Procedures

Class I inventories consist of reviewing existing data and compilation of this data into a Cultural Resource Overview document.

Class II inventories are field sampling strategies. They are designed to gather statistically valid data to provide objective estimates of the nature and distribution of cultural resources in a defined study area. Sample areas selected for survey in a Class II inventory are surveyed at the same intensity as for a Class III inventory.

Class III inventories are intensive field survey strategies designed to identify (from surface and exposed subsurface indications) and record all cultural resource sites within a specific location. Class III inventories are completed prior to beginning projects that may cause disturbance or destruction of sites. Activities related to timber sales, road construction, and range improvements are typical of the kinds of projects which require Class III inventories.

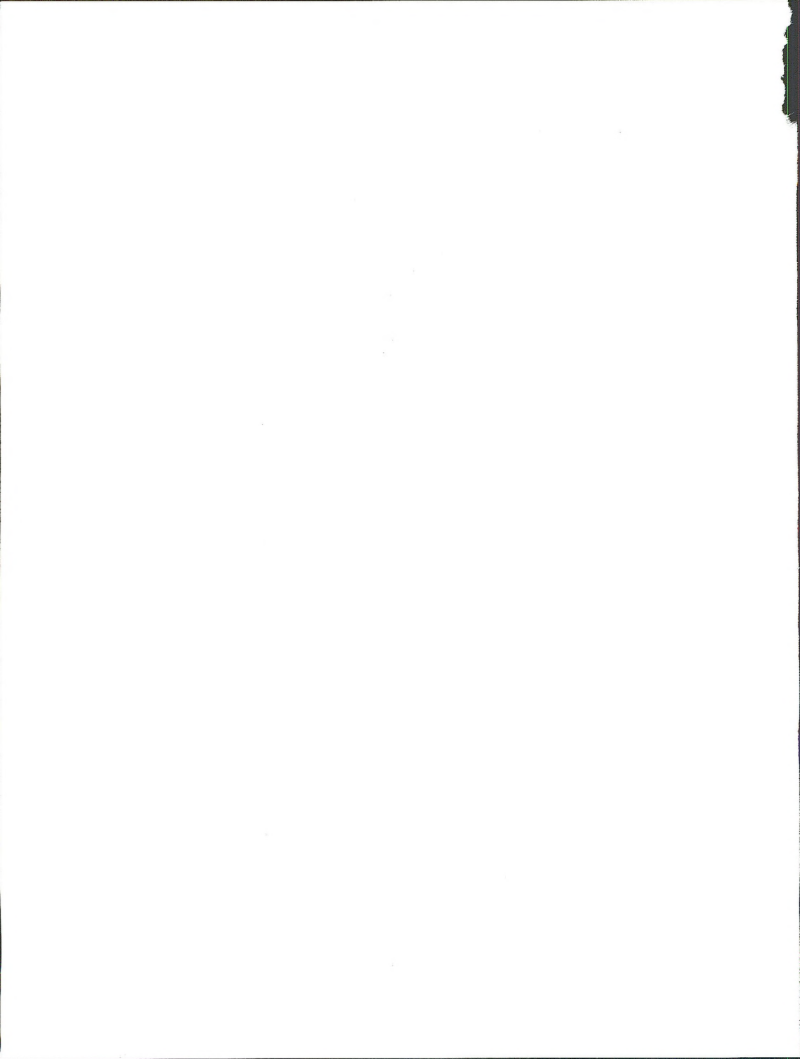
When possible, sections of project areas will be resurveyed after completion of the project. These post project surveys will estimate the accuracy of the original survey.

Class I inventories of Klamath Falls Resource Area lands were conducted in 1978 and 1979 before the formation of the resource area. A Class I inventory from the previous Jackson-Klamath Planning Unit of the Medford District covers the west side of the Klamath Falls Resource Area and a Class I inventory from the Lakeview District covers the east side.

A Class II inventory of 750 acres (12.5 percent) of BLM-administered land in the upper Klamath River Canyon was conducted in 1989.

Class III inventories have been conducted on approximately 25,600 acres (12 percent) of the 212,000 acres of BLM-administered land in the Klamath Falls Resource Area.

The eligibility of some cultural resource sites for inclusion on the National Register of Historic Places has been assessed using criteria described in 36 CFR 60.0. None of these sites have been nominated yet, although parts of the Gerber Reservoir area, upper Klamath River Canyon, and Bryant Mountain may be eligible as National Register Historic Districts.



# Appendix S

## Soil Resources

### Introduction

This appendix has two major parts. The first part deals with a forest inventory process, which is based to some degree on soils. The second section (Soils) deals with properties of soils, such as compaction, erosion, and nutrients.

### Forest Inventory

The ability of the land to grow trees, the location and condition of the trees, and the growth rate and present volume of the trees is information that is necessary when preparing land use plans. The BLM obtains this information primarily through three inventory systems, the Timber Production Capability Classification, Operations Inventory, and Forest Reinventory. This appendix describes these inventory procedures.

### Timber Production Capability Classification

The Timber Production Capability Classification is an intensive inventory process initiated in 1972 to categorize all BLM-administered land in Oregon based upon the land's physical and biological ability to grow trees. The Timber Production Capability Classification was conducted in accordance with Oregon BLM Manual Supplement 5250.

In 1976 a west side Timber Production Capability Classification inventory identified high intensity commercial forest land that could be managed on a sustained yield basis. This land formed the potential timber production base for computation of the annual probable sale quantity. Approximately 37,160 acres were identified in this category. The Timber Production Capability Classification also identified 2,560 acres of low intensity commercial forest land determined to have a regeneration period longer than five years, but potentially harvestable without site deterioration. Commercial forest lands with severe regeneration problems and fragile soils (1,960 acres) were classified as limited management lands. Sites were placed in this category only when it was judged that economically reasonable technology was not available to mitigate such deterioration. Low intensity management and limited management lands were excluded from the normal potential timber production base for computation of the annual probable sale quantity. The remainder of the west side's 8,960 acres were classified as either non-forest or noncommercial forest.

In 1986 the Oregon State Office issued Handbook 5251-1 Timber Production Capability Classification, which replaced the 1972 Manual Supplement used in 1976 and 1984.

The 1984 the east side Timber Production Capability Classification, updated in 1988 and 1994, identified 15,330 acres as suitable commercial forest land. The inventory also identified suitable woodland with classifications of low site (1,710 acres), nonsuitable commercial forest land with harsh sites and long regeneration periods (4,400 acres), and noncommercial species (69,790 acres of juniper woodland). The remaining 72,790 acres were classified as non-forest. Table 3-32 in Chapter 3 displays how the Klamath Falls Resource Area lands are classified. Juniper woodlands are further described separately at the end of this appendix.

The land base used for computation of probable sale quantities using the two Timber Production Capability Classification systems are not directly comparable. The 1988 system contains two woodland classifications that did not exist in 1976. Each of the woodland categories could be components of the probable sale quantity. By

contrast, the 1976 system by definition withdrew from planned harvest lands classified as non-forest land, low site, and noncommercial species.

The Timber Production Capability Classification Handbook is available for inspection during normal working hours at the Klamath Falls Resource Area office, and provides a complete description of the classifications.

## Operations Inventory

For BLM to carry out a timber management program effectively, specific information as to the location and current condition of the various forest types within the land base must be available to managers. This is accomplished through the Operations Inventory in accordance with procedures contained in the Operations Inventory Handbook.

The Operations Inventory is an intensive inventory which divides the forests into survey units sufficiently uniform in composition, condition, operability, productivity, or other characteristics to distinguish them from adjacent units. Information on each unit is maintained in the MICRO\*STORMS computer system. Each survey unit has information on location, acreage, stand condition, past management, silvicultural needs, and opportunities for application of intensive management practices.

## Forest Reinventory

The purpose of the extensive inventory is to determine the present volume of the trees in the district. A reinventory of commercial forest land was completed in 1988 employing procedures developed jointly by the U.S. Forest Service and the BLM. The reinventory used the same basic inventory design applied during preparation of the present management plan. The inventory is a stratified, random sample of the commercial forest land base. Each plot is a cluster of five sample points for west side lands and ten sample points for east side lands. Each point is the center of both a fixed and variable radius plot. The objective of the inventory is to estimate the total coniferous volume within plus or minus ten percent (two standard deviations).

The volume on present stands is derived from permanent, continuous forest inventory plots. Inventory plots are stratified based on site index, age, and major Timber Production Capability Classification category (suitable commercial forest land, suitable woodland, non-suitable woodland, and non-forest).

More information on these inventory systems is available from the Klamath Falls Resource Area office.

## East Side Juniper Woodlands

Most stands of western juniper are found on the east side of the Klamath Falls Resource Area. Following Timber Production Capability Classification direction, lands occupied by western juniper that are at least ten percent stocked, were classified as forest land. These lands were, by definition, further classified as noncommercial (capable of producing only noncommercial tree species), and as suitable woodland (biologically capable of supporting a sustained yield of forest products). As suitable woodlands, juniper woodlands are considered available for management for timber products, unless the resource management planning process excludes them from such use.

Under natural conditions, periodic fires confined most juniper to less fire-prone rock outcrops, and to shallow soils over deeply fractured bedrock. Today, these natural stands are the "old growth" or "ancient" juniper found in scattered locations on the east side.

In the last 100 years, livestock grazing and suppression of fires have allowed western juniper to invade plant communities where it would not be present naturally. At present, juniper is actively invading sagebrush grasslands, aspen, mountain mahogany, bitterbrush, ponderosa pine, and riparian-wetland areas. As these invasive juniper stands mature, their site domination becomes complete. Grass, brush, forbs, and other vegetation naturally adapted to a site are replaced by juniper, an invasive species. Ecosystem degradation through loss of

species diversity and soil erosion often follow. Although Inventory information is not available, it is estimated that at least 75 percent of the east side juniper woodland acreage is invasive.

In addition, if Timber Production Capability Classification direction were literally followed, most of the other 61,000 acres of east side lands not presently classified as commercial forest or woodland, could be classified as juniper woodland. These lands could be invaded, and fit the classification requirement as "capable of being at least 10 percent stocked by forest trees". However, the Klamath Falls Resource Area classified these lands by their present vegetative cover (rock, brush, grass), and not by the potential for invasion by and conversion to, western juniper. It was felt that active management (through prescribed fire or mechanical control) would prevent continued unnatural juniper invasion of these lands.

Whether the invasive juniper woodlands should be managed for timber products, for the native vegetation existing prior to invasion, or for a combination of products and values, will be decided by the planning process. The Timber Production Capability Classification is an inventory process that has classified Klamath Falls Resource Area lands based on their physical and biological ability to grow trees, and the assumptions described above.

## Soils

Soil disturbance usually is an unavoidable consequence of most management activities. The Klamath Falls Resource Area's soils differ in their degree of sensitivity to disturbances. The type and magnitude of disturbance determines the effects on soil productivity. Timber management practices, including road construction, and livestock grazing are the dominant management activities that create soil disturbances which include compaction/displacement, erosion, and loss of organic material and nutrition.

Both soil and non-soil factors influence soil productivity. Non-soil factors, such as geology, are not influenced by forest management activities. Soil factors which can be modified by management activities include: structure; density; organic matter content and distribution; the amount, distribution, and continuity of pore space; soil moisture and temperature; the effective soil volume for root development and water, heat, and gas storage; nutrient content; and microbial activity. Soils in the Klamath Falls Resource Area differ in their degree of sensitivity to disturbances. Determining the suitability of specific soils for management practices is an important first step in preventing or minimizing soil-related adverse effects.

Organic matter within the soil is an important source of nutrients for vegetation. Soil microbial populations slowly decompose the organic matter, releasing nutrients. The cation exchange capacity of organic matter helps hold nutrients within the rooting zone of plants. Organic matter acts as a mulch to retain soil moisture and is the key to maintaining good soil structure. The mulching effect of organic matter also reduces surface erosion by lessening the effect of raindrops, which tend to dislodge soil particles.

Soil texture (the relative proportions of sand, silt, and clay) determine certain soil characteristics. Management activities have no effect of texture, but they can affect the structure. Soil conditions and characteristics, such as water availability and movement, heat transfer, aeration, bulk density (weight per unit volume), and porosity, are influenced by structure.

Soil porosity, which is a function of pore size and distribution, influences soil-water relationships, aeration, and mechanical resistance to root penetration. Soil depth influences water holding capacity, rooting depth, and plant anchorage.

Soil organisms affect forest-site productivity through capture and uptake of nutrients, nitrogen fixation, protection against pathogens, maintenance of soil structure, and buffering against moisture stress (Perry et al. 1989). Certain forest practices, such as burning, can reduce or eliminate beneficial soil organisms.



## Compaction and Displacement

Soil compaction is the process where soil pore space is reduced because of physical pressure and vibration exerted on the soil surface. Compaction results in reduced plant growth due to reduced water infiltration, and reduced gaseous and nutrient exchange rates. Physical resistance to root growth can occur with high soil densities. Compaction may also affect populations of soil organisms, but the resultant tree growth impact is unknown.

Soil displacement is a process when a portion or all of the surface soil is moved by mechanical action. This may affect plant growth, depending on distance moved, by removing nutrients and soil organisms and by reducing available water and rooting depth.

A compacted soil shows an increased bulk density (dry soil weight per unit volume) as a result of applied loads, vibration or pressure. These compacting forces can originate from many sources, from foot traffic to the wheels or tracks of heavy machinery. Compaction usually involves the reduction of soil macropore space and generally occurs at depths greater than two inches. A soil is considered to be detrimentally compacted when there is an increase in soil bulk density of 15 percent or more over the undisturbed level; and/or when soil macropore space (pores over 0.038 mm) are reduced by 50 percent or more (BLM 1988a; U.S. Forest Service Manual Supplement 45, Section 2520.4).

The degree of compaction that occurs in any given area is influenced by several factors: the amount and type of pressure and vibration applied; the depth and nature of surface litter; soil texture and structure; and the soil moisture level during compaction (Adams and Froehlich undated). Soil compaction can persist for decades, or it can be significantly reduced within a few years under favorable conditions. These conditions exist when soils contain active plant roots or organisms and/or when soil are subjected to regular freeze-thaw and wet-dry cycles (Adams and Froehlich undated). Vanderheyden (1980) found no apparent compaction recovery after 38 years on a variety of soil textures in the western Cascades of Oregon.

There are various ways in which to identify heavily compacted soils in the field. These soils are often difficult to penetrate and excavate with a shovel or spade, especially when the soil is dry. The individual clods excavated from a compacted soil are often large and difficult to break up. The soil, when broken apart, often fractures into flat, platy pieces that are oriented parallel to the soil surface. Forest soils generally have a more granular or crumbly structure near the surface. Stunted trees or standing water during periods of relatively dry weather can also indicate areas of severe compaction (Adams and Froehlich undated). Compaction can be measured through a variety of methods, including collecting core samples and calculating bulk density changes and/or using a nuclear densimeter, air permeameter or a hand-held soil penetrometer to measure soil density and resistance to applied force.

Forest management practices in the Klamath Falls Resource area commonly involve some type of heavy machinery. Timber harvest and site preparation methods together with the soil conditions during operation influence the degree of soil compaction and displacement. The yarding system used during timber harvest affects the amount of soil disturbed. The amount of compaction and displacement created by ground-based yarding primarily depends on the areal extent of yarding trails, soil moisture during yarding, the number of passes over each trail, and mitigation methods used. Power (1987) and Dyrness (1965) reported that detrimental soil compaction and displacement created by ground-based yarding covered 25 percent of a harvest unit. Wert and Thomas (1981) reported Douglas fir growth losses 32 years after harvest on 43 percent of ground-based yarding skid trails and immediately adjacent (within 3 meters) areas. Compaction resulting from cable yarding is generally less than that resulting from ground-based systems. In addition, the more a log is suspended during yarding with a cable system, the less the soils are disturbed; thus, skyline systems generally disrupt less than highlead systems (Dyrness 1967). Dyrness (1967) and Ruth (1967) reported soil disturbance created by highlead and skyline cable yarding, however tree growth effects from cable yarding are as yet inconclusive.

The amount of soils compaction and displacement and tree growth losses created by mechanical site preparation vary with differing conditions (for example, the amount of material to be piled, soil moisture, machine type and operation, depth of organic matter layers, and number of machine passes). The major increase in density



occurs after the first machine pass when soils are wet and after the first three to five passes when soils are relatively dry (Froehlich and McNabb 1984, Steinbrenner 1955). Davis (1992) measured bulk density changes on soils within and adjacent to a 20 hectare (50 acres) clearcut in central Oregon. Yarding was done with rubber-tired skidders and slash was piled with crawler tractors. Average bulk density of the cobbly loam soils in the unit was 23 percent higher than undisturbed controls following yarding and piling. Detrimental compaction existed on 60-66 percent of the harvest area.

The areal extent of detrimental soil compaction and displacement created by ground-based yarding can be minimized by using designated skid trails that are restricted to a predetermined percentage of the harvest unit (Froehlich et al. 1981, Garland 1982, BLM Compaction Guidelines 1983). Additional benefits are possible when permanent skid trails are established in a managed forest, because repeated equipment entries will not increase the area in skid trails (Davis 1992). The use of designated trails during thinning operations in young conifer stands can be economical and efficient if trees are felled to the lead of evenly spaced trails and logs are winched to the skidder. Topography, equipment, and stand conditions will affect the design and suitability of designated trail systems (Davis 1992). Another related approach for reducing compaction is to establish in the logging contract a percentage limit for the amount of area within a unit that can be covered by skid trails. This can encourage use of a planned skid trail system and the use of techniques such as log winching while allowing flexibility to deal with a wide range of logging and operator situations (Davis 1992).

Detrimental soil compaction created by mechanical site preparation can be minimized or avoided by using low ground pressure equipment or a tracked backhoe/excavator for piling and/or limiting the number of passes of heavy machinery over a particular area to two (forward and back) when soils are dry and most resistant to compaction. Soil moisture restrictions can vary in effectiveness, due to the variety of soil and equipment characteristics which generally require that each soil type and operation be evaluated independently. Soil moisture content is often highly variable on any given site, and in areas or in years where soil moisture levels remain high, the operability of these sites can become too limited (Davis 1992).

Tillage can fracture and improve compacted soil. The degree of fracturing varies with tillage equipment, machine operation, and soil and site conditions (such as texture, moisture, and coarse rock fragment content). Andrus and Froehlich (1983) reported fracturing of approximately 80 percent for properly designed winged rippers. Davis (1990) reported bulk densities of compacted areas tilled with a self-drafting winged subsoiler were not significantly different than those in uncompacted areas. Although soil structure and pores are not returned to their natural condition by tillage, it is commonly accepted that tillage increases the productivity of compacted soils. No research has been conducted that correlates the degree of fracturing and restoration of soil density with a similar degree of growth potential restoration.

## Soil Erosion and Mass Wasting (Landsliding)

Surface and mass wasting are two types of soil erosion that affect long term productivity of forest soils. Both are naturally occurring geologic processes involving gravity, soil water, and precipitation events.

Surface soil erosion, which includes sheet, rill, gully, and dry raveling, is the detachment and downslope movement of individual soil particles or aggregates. It is caused either by the energy of rainfall and running water acting on bare soils, or by surface disturbance on steep slopes. Freezing and thawing, especially on a daily basis, can cause considerable erosion on disturbed ground. This is particularly apparent in road cutbanks and areas with exposed soil. Removal of soil cover can greatly increase the potential for surface soil erosion. For example, one study found that a severe storm following a ponderosa pine wildfire caused the erosion of 13.8 tons of soil per acre. Within one year, reestablished ground cover resulted in significantly reduced erosion (Hungerford et al. 1991). More information on soil erosion can be found in Appendix P.

Mass wasting (landsliding) is the downslope movement of soil and rock material. The volume of mass wasting events can range from a few cubic feet to thousands of cubic yards. Some of the more important factors that contribute to soil and slope instability are steep gradient, low soil strength, declining root strength, shallow soil depth, road construction, and a high frequency, duration, and intensity of precipitation.

Several distinct types of mass movement are recognized. Debris avalanches and debris torrents are similar in that both occur on steep slopes, are fast moving, and are composed of soil, rock, water, and organic material. Torrents are water charged and occur in drainages, whereas avalanches lack the high water content and may or may not occur in drainages. These are the most dangerous types of landsliding and usually produce the most dramatic on- and off-site effects. Various slow moving types of mass movement, such as shallow earth flows, rotational slumps, and deep-seated geologic events, occur and are usually initiated by excessive water. Major concerns and effects of mass wasting are public safety, private property, roads, bridges, water quality, and fisheries.

Reduction in root strength following timber harvest and site preparation activities is possibly a significant cause of landsliding outside the area of road construction. These changes match the high frequency of landslides seen the first few years after timber harvest on slopes in western Oregon with high potential for failure (Burroughs and Thomas 1977). The areas most sensitive to a loss of root strength and subsequent translational-type landsliding (the slip surface is relatively shallow, planar, and roughly parallel to the ground surface) are usually steep (70 percent or greater) slopes in concave positions over hard bedrock in areas of high rainfall. Rotational-type landslides (the slip surface is relatively deep and circular) are less sensitive to the root strength factor but are sensitive to disturbances to soil and ground water and natural slope configuration.

## Nutrient Status

Organic matter acts as the primary reservoir for several nutrients important to plant growth: phosphorous, sulfur, and nitrogen. The role of organic matter in the storage of nitrogen is especially important in forests because their continued high productivity depends, to a large extent, on large supplies of available nitrogen. Nutrients stored in organic matter are released slowly during decomposition, providing an efficient, steady source of nutrients (DeBano 1991). Organic matter helps to insulate the ground surface from solar radiation, which can raise soil temperatures and stress vegetation, and retain moisture by direct absorption or through reduced evaporation from the soil surface. The welfare of soil microorganisms depends on organic matter because it provide both habitat and a food source (DeBano 1991).

Soil organic matter accumulation and cycling are related to site index. When compared to lower site indices, higher sites have more organic matter incorporated in the soil and a larger nitrogen pool; therefore, productivity is usually more resilient on higher sites. For maintenance of long-term productivity, conservation of organic matter on low sites is more important than on high sites.

Harvest and site preparation intensities and frequencies influence the amount and composition of the surface organic layer. Conservation of small materials (needles, leaves, and twigs) is important for the total nitrogen on a site because these materials have the highest concentrations of nitrogen. When compared to needles and twigs, the removal of large materials (stemwood and large branches) has less effect on nitrogen supply. However, the large materials are important for continuation of healthy symbiotic fungi populations (Maser et al. 1978). Prescribed fire and wildfire can combust organic matter, which in turn can change the availability of nutrients and cause changes in other chemical, physical and microbiological properties of the underlying soil.

## The Role of Soil in Watershed Health

**General.** A watershed is the area of land on which water falls from the atmosphere, is stored within the soil, and, over a period of time, is released downslope to other locations. All land is part of a watershed. An individual watershed acts like a catchment area that is divided from the next watershed by topographic features like ridge tops. The water that falls within a watershed that isn't used by existing vegetation will flow over land or through the soil to the lowest points in the watershed. This water should appear in the stream or river that drains the watershed.

Watersheds vary greatly in their natural erosion and flood behavior. In some watersheds vegetative cover and soil have not developed sufficiently to exert much influence on the way water is yielded from the land. In these

places, erosion, sedimentation and flooding can be high. In many watersheds, vegetation and soil have developed to exert a high degree of control on watershed function. Low rates of erosion, normally moderate peak stream discharges, normally small sediment loads, and optimum infiltration can result. The key lies in controlling the water that falls on each acre (Anderson 1993).

A watershed has three primary functions: capturing water, storing it in the soil, and releasing it safely. The factors influencing watershed function include: vegetation; surface geology; the texture, structure, depth and rock content of soils; the frequency, intensity, kind and duration of precipitation, frosts and thaws; runoff (amount and intensity of peak flows); topography; land use; upland erosion; and stream channel erosion (Anderson 1993). Vegetation and surface soil structure are the factors most influenced by land management.

**Capture.** The process of getting water from the atmosphere into the soil. All moisture received from the atmosphere, whether as rain or snow, should have the maximum opportunity to enter the ground at the point where it falls. Plant cover on the soil surface can trap rain which helps precipitation seep into the soil rather than running off the site. Plant cover reduces raindrop impact upon the soil surface and minimizes soil crusting (creation of an impervious soil surface) and erosion. Plant litter and organic matter absorbs rain and melting snow and helps keep soil moist. Plant cover can trap snow at or very near the soil surface and reduces soil freezing by acting as insulation. Keeping the soil from freezing and storing snow "in place" helps melting snow enter the soil. Healthy vegetative cover with its accompanying root mass can keep soil more permeable so moisture readily percolates into the soil for storage. The effectiveness of vegetation in the capture of water is influenced by vegetational type, stand density, size, land use, and the uniformity of the total vegetational cover, including litter (Anderson 1993). For example, a dense, uniformly-distributed cover of vigorous perennial grass can be highly effective for the capture of water in rangeland watersheds.

**Storage.** Once water has entered the soil, it is stored between soil particles in one of three ways. This storage can be temporary or long-term and is dependent soil depth, texture, and structure. **Hygroscopic** water is that portion of soil water that is held tightly adhered to individual soil grains. It has no movement as a liquid and is not available for biological functions, including plant growth. It is depleted by heat and, once lost, must be fully replaced before water enters other portions of the soil structure. **Capillary** water is soil water in excess of the maximum held as hygroscopic water. It lies in the interstices between soil grains. When the maximum of both hygroscopic and capillary soil water is reached, this condition is called maximum field capacity. **Gravitational** water is that soil water in excess of maximum field capacity which moves through the soil to form seeps, springs and streams. This movement of water through the soil is called percolation (Anderson 1993).

Moisture leaves the soil in three ways: through evapotranspiration, percolation into the groundwater aquifer, and through direct evaporation from bare soil surfaces. The kinds and amount of vegetation and the plant community structure can greatly affect the storage of water on any particular site. Evaporation can occur from direct air movement over the soil (which can wick away moisture) and by high soil temperatures from warming in direct sunlight. Retention of plants and litter on and in the soil helps reduce soil evaporation through shading the soil and providing protective cover.

**Safe Release.** In this process, water moves through the soil to seeps, springs, and ultimately into streams and rivers which are water's path from the uplands. The amount and rate of water released depends on how much water is already in the soils of the uplands, riparian areas and streambanks. If soils are filled with moisture to their maximum field capacity, then the excess from rain or melting snow will be released downstream. Also, the rate of precipitation that falls affects the amount and rate of water release. Soils can take in water up to a certain rate that is generally dependent on the soil type and plant and litter cover. If rain or melting snow is applied at a rate that is faster than the soil can absorb, then the excess water is not absorbed but runs off the site. In general, it is more desirable that water should be released slowly through the stream system rather than rapidly running over the land. The latter results in short and severe peaks in stream flow and more erosion.

The following list summarizes various components of the three watershed functions discussed above. An assessment of watershed health should examine all of the pertinent components and evaluate how land management activities contribute to or detract from the three watershed functions.

## *Appendix S - Soil Resources*

### ***Capture:***

- ◆ vegetative canopy allows moisture from typical storm events to reach the soil surface;
- ◆ standing vegetation captures blowing or drifting snow;
- ◆ organic material (plant litter, standing vegetation) protects the soil surface from raindrop impact;
- ◆ coarse fragments protect the soil surface from raindrop impact;
- ◆ water is not restricted from infiltrating the soil surface (that is, presence of organic material; absence of physical soil crusting, capping, surface sealing);
- ◆ subsurface soil conditions support infiltration rates (that is, compaction layers and evidence of frost heave are uncommon).
- ◆ standing vegetation and plant litter detain overland flow and trap sediment;
- ◆ surface roughness detains overland flow;
- ◆ evidence of excessive overland flow (for example, rills and gullies, pedestalling) is uncommon;
- ◆ soil surface appears to be stable; evidence of excessive soil movement is uncommon.

### ***Storage:***

- ◆ plant cover and litter protect the soil surface from the evaporative effects of sun and wind;
- ◆ plant communities are consistent with soil water-holding capacity, climatic conditions, and soil depth;
- ◆ plants are vigorous and productive.

### ***Safe Release:***

- ◆ seeps, springs, and lower-order streams flow during drier seasons;
- ◆ seeps, springs, and streams support vigorous stands of phreatophytic plants;
- ◆ ephemeral drainages are stable (lack evidence of active downcutting and bankcutting).



# Appendix T

## Analytical Assumptions About Global Climate Change

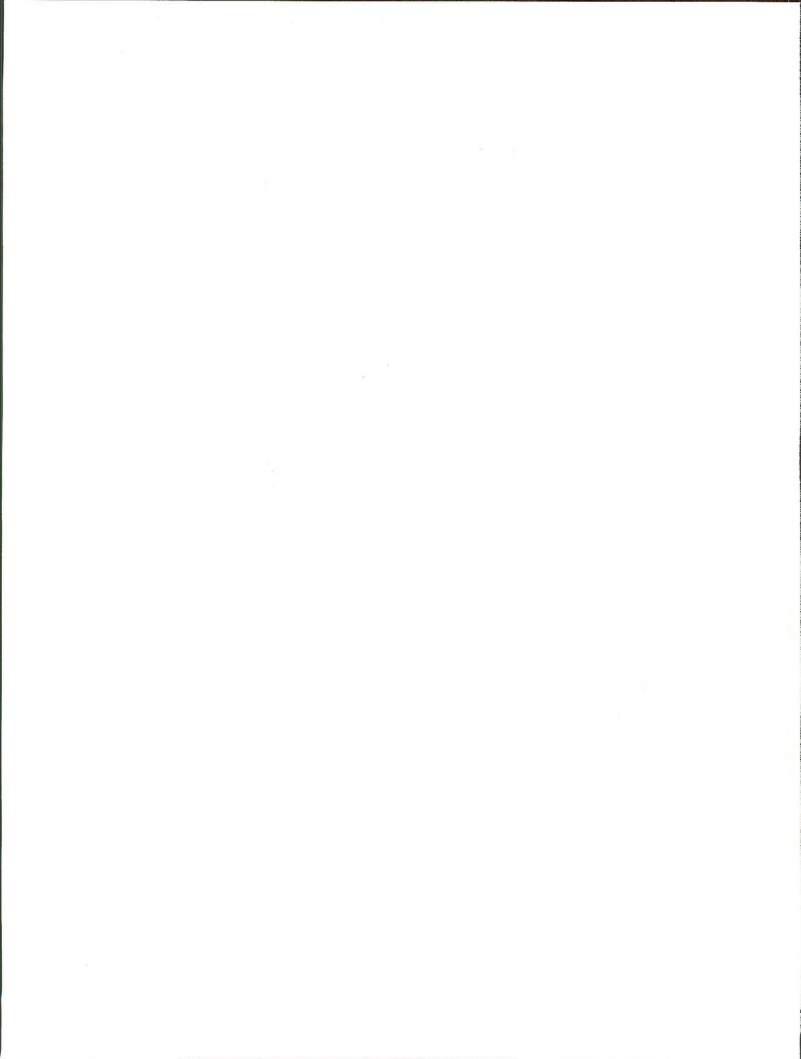
Many scientists have predicted significant global warming within the next sixty years, due to increasing levels of carbon dioxide and other gases in the atmosphere. Others have hypothesized a climate change in western Oregon that would make it difficult or impossible to maintain, without change, the current ecosystems, including the major forest tree species. Among the relevant uncertainties, it is expected that warmer, drier weather would increase the incidence of wildfire, but warmer, wetter weather could reduce it. Rapid change could make the forest more susceptible to insect and disease attack because generational succession occurs much quicker quickly among pests than among trees. Other possible effects include increasing soil temperatures and lengthening summer droughts. This could shift the range of Douglas fir forests toward higher elevations, reduce the range of current high-elevation species, and increase the range of dryland species, such as lodgepole and ponderosa pine. Thus, management practices, particularly stand establishment and manipulation, could be affected. Assuring adequate tree regeneration would probably be the most serious management problem in areas that become marginal (Regens et al. 1989).

There is no scientific consensus about the expected extent or rate of global warming or the probable effect on forest ecosystems in western Oregon. Neither the environmental record nor the limited capabilities of the climate models permit a reliable forecast of climate changes (National Academy of Sciences 1991). Furthermore, available models show marked differences in their predictions of change for western Oregon (Joyce et al. 1990). In addition, the most commonly predicted temperature changes are not expected to affect woody biomass production or the dominance of Douglas fir in the region, although they could alter codominant species composition in older forests (Dale and Franklin 1989). At the high end of the range of predicted changes, however, are temperature increases that could be great enough, by around the middle of the 21st century, to inadequately meet the winter "chilling requirement" for Douglas fir to restart growth (Lavender 1989) in the spring.

The increasing carbon dioxide levels are generally thought to be beneficial to plant growth, but available information does not suggest which forest tree species may be most responsive to that increase or how their responsiveness may also be affected by any changes in the climate or by fertilization in managed forests. Although climate change may occur and may, in a number of decades, affect the species composition of the forest, it is not considered likely to affect forestry practices during the life of the plan. Nonetheless, the draft plan incorporates a process of adaptive management (see the chapter 2 Use of the Plan section) permitting effective response to changing knowledge. Thus, should a scientific consensus emerge during the life of the plan, indicating that forestry practices should be modified promptly in anticipation of the effects of global warming, the BLM would be able to adjust.

Harmon et al. (1990) calculated that the past harvest of 5 million hectares (12.5 million acres) of old growth in the Pacific northwest accounted for 2 percent of the total carbon released because of land use changes in the last 100 years. The total added by all such land use changes increased atmospheric carbon by 25 percent. Thus, harvest of that 12.5 million acres added .05 percent to atmospheric carbon. By extension, each million acres of old growth harvested adds 0.04 percent.

Taken to the level of RMP/EIS analysis, each 10,000 acres of old growth that would be harvested (this assumes clearcutting) would add 0.0004 percent to total atmospheric carbon.





# Appendix U

## Management Direction and Consequences of Managing Visual Resources Under Each Alternative

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Alternative	Management Direction/Consequences
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No Action	No areas would be downgraded from old inventory standards. All areas would be managed at Management Framework Plan visual resource management classification standards.
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A	No areas would be upgraded from inventory classifications.
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Visual Resource Management Class I

No acres of land inventoried as Visual Resource Management Class I would be downgraded to Visual Resource Management Class IV and, during the life of the plan, no acres of downgraded Visual Resource Management Class I land would be harvested at Visual Resource Management Class IV standards.

Visual Resource Management Class II

Approximately 11,700 acres of land inventoried as Visual Resource Management Class II land would be downgraded to Visual Resource Management Class IV and, during the life of the plan, would be available for timber harvest.

Visual Resource Management Class III

Approximately 30,700 acres of land inventoried as Visual Resource Management Class III land would be downgraded to Visual Resource Management Class IV and, during the life of the plan, would be available for timber harvest.

B	No areas would be upgraded from inventory classifications.
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Visual Resource Management Class I

No acres of land inventoried as Visual Resource Management Class I would be downgraded to Visual Resource Management Class IV and, during the life of the plan, no acres of downgraded Visual Resource Management Class I would be harvested at Visual Resource Management Class IV standards.

Visual Resource Management Class II

Approximately 5,600 acres of land inventoried as Visual Resource Management Class II would be downgraded to Visual Resource Management Class IV and, during the life of the plan, would be available for timber harvest.

Visual Resource Management Class III

Approximately 28,100 acres of land inventoried as Visual Resource Management Class III would be downgraded to Visual Resource Management Class IV and, during the life of the plan, would be available for timber harvest.

**Alternative Management Direction/Consequences**

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**C** No areas would be upgraded from inventory classifications.

Visual Resource Management Class I

No acres of land inventoried as Visual Resource Management Class 1 would be downgraded to Visual Resource Management Class IV and, during the life of the plan, no acres of downgraded Visual Resource Management Class 1 land would be harvested at Visual Resource Management Class IV standards.

Visual Resource Management Class II

Approximately 1,700 acres of land inventoried as Visual Resource Management Class II would be downgraded to Visual Resource Management Class IV and, during the life of the plan, would be available for timber harvest.

Visual Resource Management Class III

Approximately 18,200 acres of land inventoried as Visual Resource Management Class III would be downgraded to Visual Resource Management Class IV and, during the life of the plan, would be available for timber harvest.

**D** No areas would be upgraded or downgraded from inventory classifications.

Visual Resource Management Class I

No acres would be harvested.

Visual Resource Management Class II

Approximately 34,600 acres would be managed according to Visual Resource Management Class II standards during the life of the plan.

Visual Resource Management Class III

Approximately 81,100 acres would be managed according to Visual Resource Management Class III standards during the life of the plan.

**E** All BLM land would be managed to Visual Resource Management Class III standards or better.

Visual Resource Management Class I

Land inventoried as Visual Resource Management Class I would not be downgraded or harvested, and approximately 3,800 acres would be upgraded to Visual Resource Management Class I.

Visual Resource Management Class II

Land inventoried as Visual Resource Management Class II would not be downgraded; therefore no Visual Resource Management Class II land would be managed at lower standards, and approximately 100 acres would be harvested at Visual Resource Management Class II standards during the life of the plan.

Visual Resource Management Class III

Land inventoried as Visual Resource Management Class III would not be downgraded; therefore no Visual Resource Management Class III land would be managed at lower standards, however approximately 96,400 acres would be upgraded to Visual Resource Management Class III, and approximately 300 acres would be harvested at Visual Resource Management Class III standards during the life of the plan.

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## Alternative Management Direction/Consequences

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**Proposed  
Resource  
Management  
Plan**

Some areas would be upgraded or downgraded from inventory classifications. Areas of BLM land around developed recreation sites and Spencer Creek would be upgraded from inventory standards. Some areas of BLM land within ¼ mile of rural interface areas and state and federal highways would be downgraded from inventory standards.

Visual Resource Management Class I

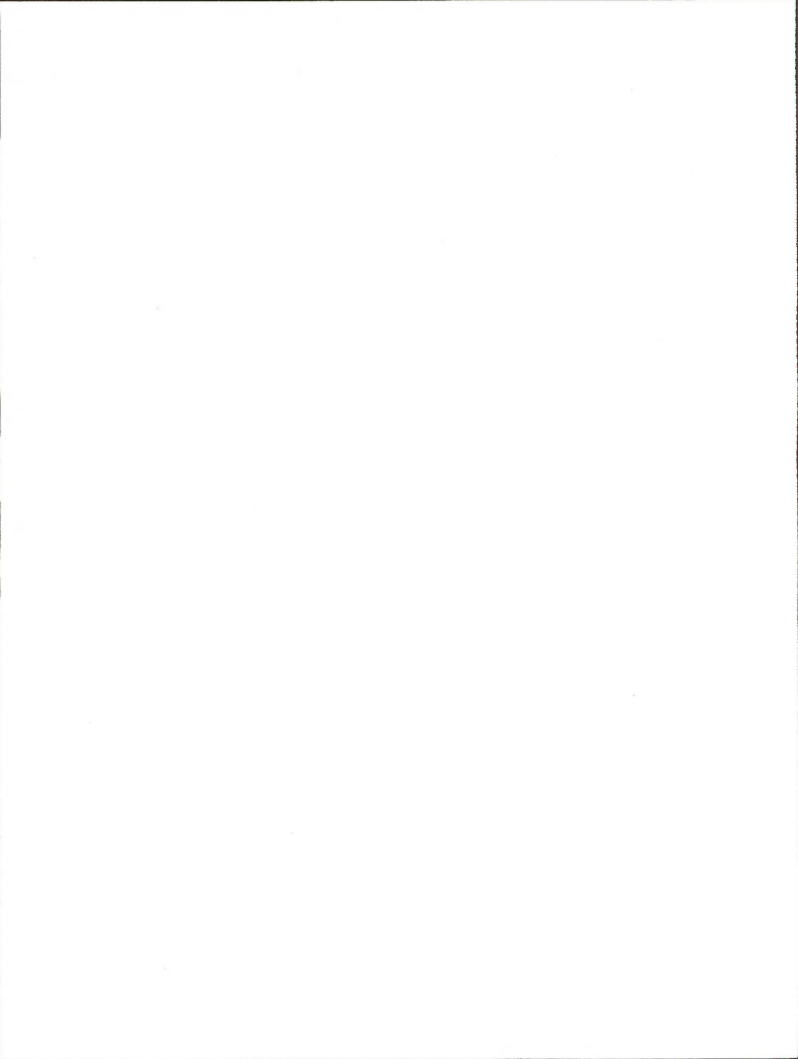
No land has been inventoried as Visual Resource Management Class I, and no acres would be upgraded to Visual Resource Management Class I.

Visual Resource Management Class II

Approximately 33,500 acres would be managed to meet Visual Resource Management Class II standards during the life of the plan.

Visual Resource Management Class III

Approximately 81,850 acres would be managed to meet Visual Resource Management Class III standards during the life of the plan.



# Appendix V

## Selection of Harvest Scheduling Model and Probable Sale Quantity Calculation Process

### Selection Of Model

In 1986, early in the planning effort, the BLM began to explore the timber harvest scheduling model options available. A timber harvest scheduling model combines timber production capability, operations inventory, and forest plot data for a given land base with proposed timber management prescriptions to determine potential annual timber harvest levels and their sustainability over the long term. By early 1987, TRIM-PLUS (Timber Resource Inventory Model - Plus Harvest Scheduling Enhanced), a binary search simulation model used for harvest scheduling and timber supply modeling, had been tentatively identified as most relevant to the BLM's needs. In the spring of 1987 public workshops were held on the model for interested parties. After considering the comments received that spring and summer, and testing the model on data from the late 1970s, the TRIM-PLUS model was selected.

The features of TRIM-PLUS that made it seem to be the optimum approach for the BLM's use were its ability to:

- ◆ make individual nondeclining harvest level calculations on multiple minimum harvest ages;
- ◆ handle various land use classes simultaneously;
- ◆ be used at the district level on enhanced personal computers;
- ◆ provide enhanced report generating and graphics capabilities;
- ◆ provide simplified input/output data (ease of use); and
- ◆ provide relatively inexpensive computer runs.

In 1991, the model was modified to permit simulation of multiple-canopy or uneven-age management prescriptions.

Although harvest scheduling models of various degrees of complexity were considered, the intent was to identify a relatively simple and reliable state-of-the-art system. The ability to interface the selected model with other specific resource analysis models/procedures, such as an elk habitat model, and to use the BLM's automated (mapped) resource database was desired. This interface process identifies different land use allocations in terms of acres and the model reflects resulting harvest level impacts in a trackable fashion. The TRIM-PLUS model also has the capability of optimizing investment levels.

### Probable Sale Quantity Calculation Process

The probable sale quantity, an expression of the maximum nondeclining level of timber harvest sustainable over time, is estimated by TRIM-PLUS. The TRIM-PLUS model functions similarly to the SIMIX model used by the BLM in the 1970s and 1980s to generate probable sale quantities. The probable sale quantity volumes from TRIM-PLUS are given in merchantable cubic feet. Equivalent estimates in board feet are provided to help interpret the information.

The TRIM-PLUS model requires a variety of information to complete probable sale quantity computations and harvest scheduling. The information needed falls into three basic categories: acres, volumes, and management assumptions.

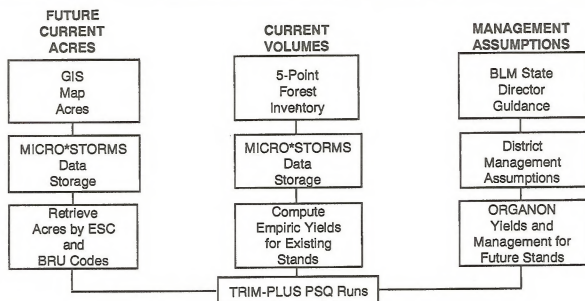
West side acreage and volume information is derived from data stored in both the continuous forest inventory (extensive inventory) plots and the geographic information system. Management assumptions are inserted into the TRIM-PLUS model via yield tables for managed stands developed by the ORGANON growth and yield model (described later in this section of the appendix). In turn, ORGANON can be used in combination with System-1, which is a young stand regeneration and competition model developed by the California Research Association in cooperation with the U.S. Forest Service Southwest Experiment Station in Berkeley, California. Computer growth simulation for new plantations can be started in System-1, modeled with various levels of competition or at different densities, and then continued in ORGANON to final harvest. Checks were run to validate the performance of System-1 for southwestern Oregon plantations. The flowchart below shows the principal components and sequence of events in preparation for making an probable sale quantity run.

## Current Acres

**Geographic Information System map acres.** Acres for the analysis of the management situation were derived from digitized west side geographic information system map overlays. These are the geographic information system map acres referred to in the probable sale quantity flowchart. There is a separate digital map for each topic or theme pertinent to the analysis of the management situation. These maps can be overlaid or merged to allow analysis and generation of acres for a wide variety of situations.

**MICRO\*STORMS Database.** The basic storage location for acres is a large relational database called MICRO\*STORMS. Data is separated into three primary files: SITE, Timber Production Capability Classification, and continuous forest inventory. Within each file, there is a separate record of information for each plot or unit of land, containing many types of data. Selected information from these or other data files have been linked to the digitized west side geographical information system maps.

### PSQ FLOWCHART



Abbreviations used in this flowchart:

GIS = Geographical Information System  
BRU = Basic Resource Unit

BLM = Bureau of Land Management  
PSQ = Probable Sale Quantity

ESC = Existing Stand Condition

Figure V-1. Probable Sale Quantity Flowchart



For the west side:

- ◆ The SITE file contains 1,247 records and is comprised of data such as the basic resource unit and existing stand condition codes, acreage, timber type, site index, past and recommended treatments, timber volumes, stand age, and land use.
- ◆ The Timber Production Capability Classification file contains 373 records and is comprised of data relating to the timber production capability classification system.
- ◆ The Continuous Forest Inventory file contains 148 records and is comprised of 5-point plot data. These data include general site descriptors, board foot and cubic volume, growth, basal area, trees per acre, average diameter at breast height, and tree heights.

**Basic Resource Units.** Within TRIM-PLUS, data is segregated by sustained yield unit, land status, forest type and site quality, existing stand condition, land use allocation, and prescription type. These groups of data are called basic resource units. The probable sale quantity and other output data from TRIM-PLUS is reported by the basic resource unit and for groups of basic resource units, as well as for the entire sustained yield unit. The total number of basic resource units established for the planning area varies between alternatives.

**Existing Stand Conditions.** Existing stand condition codes are assigned to each basic resource unit, and assist in grouping, sorting, and tracking similar kinds of stands. This sorting is accomplished by assigning the most appropriate existing stand condition code from the following list to each MICRO\*STORMS site file record.

**Table V-1. Existing Stand Condition Codes (as of 10-1-92).**

Code	Gross Forest Acres		Description
	West Side	East Side	
1, 16	3,832	175	Young stand meeting target stocking levels
2, 15	517	21	Young stand meeting minimum stock levels
3, 13, 14	75	92	Young stands which are understocked
4	276	539	Young stands, overstocked
6	2,282		Pre-commercial thinned (PCT) and fertilized
7	769	4,775	Pre-commercial thinned; not fertilized
10	1,311	1,229	Commercial thinned (CT)
11	419		Commercial thinned and fertilized
12	78		Planted, no survey
17	331		Fertilized, no PCT or CT
18	2,936		Stand at first merchantability (12 inch quadratic mean diameter)
30, 33	3,490	955	Past partial cut, non-stocked understory
31, 34	3,053	3,337	Past partial cut, understocked understory
32, 35	12,500	2,195	Past partial cut, stocked understory
38	3,914	255	Overstory removal completed
40	4,712	420	No past management
50	670		Potential conversion, brushfield
51	38		Potential conversion, hardwoods
53	220	1,278	Backlog
60	236		Sold, but not cut timber harvest unit
61	134	59	Cut, but not planted timber harvest unit
<b>TOTAL</b>	<b>41,793</b>	<b>15,330</b>	

## Current Volumes

**5-point forest inventory.** Tree volumes on present stands are derived from 224 permanent inventory plots distributed throughout the Klamath sustained yield unit. Both conifers and hardwoods were cruised by certified BLM cruisers to the same standards used in timber sale preparation. Cubic foot volumes were computed from the inventory data using a BLM software program called UNIT1. Summary plot data is stored in the continuous forest inventory MICRO\*STORMS database file.

**Empiric yields.** In contrast to projected yields from *published stand tables* or computer models, *empiric yield tables* are constructed from sample plots of existing stands. Empiric yield tables are preferred over published yield tables whenever sufficient plot data is available to build such yield curves. Empiric yield curves were not developed for stands that were managed under multiple canopy systems, such as shelterwood retention or Alternative C regimes. No empiric curves were developed for the Klamath sustained yield unit since all systems analyzed were multiple canopy systems. For multiple canopy regimes, all yield curves were developed using the ORGANON model.

## Future Management Assumptions

Different silvicultural systems, and the practices contained in those systems, affect TRIM-PLUS outputs because they produce different quantities of yield in different periods. Intensive forest practices, such as thinning or fertilization, can increase yields, but may or may not cause an increase in harvest for the current decade. Harvest increases in the current decade (termed the allowable cut effect) are dependent on the existence of surplus volume available for harvest in the decade.

Other features of silvicultural systems that affect TRIM-PLUS outputs are the retention of existing volume in partial cut systems, setting of minimum harvest ages, assumptions about future reforestation success, and assumptions about the funding and performance of stand treatments. Site productivity is assumed to remain constant.

Features of silvicultural regimes that are designed to enhance or protect ecological features or resource values other than timber production impact the probable sale quantity. These silvicultural practices include shelterwood retention to provide frost protection or to protect scenic values, canopy retention to assure habitat connectivity, and structural retention regimes.

**Basic Resource Unit management intensity levels.** Management intensity is a category within each basic resource unit that is designed to hold a yield table which represents a particular even-age management regime. Up to eight different management intensities can be applied within a given basic resource unit. These management intensities represent different combinations of silvicultural treatments to be applied to the acres represented in the basic resource unit. The level of treatment can vary from no treatment to a variety of growth enhancement practices applied on a regular time interval. Specific configuration of the management intensities vary within each basic resource unit. Management intensities are configured in two different manners, depending on the general silvicultural regime being modeled (even-age or multiple-canopy).

For *even-age regimes* the configuration is as follows:

<u>Management Intensity</u>	<u>Description</u>
1	Untreated residual stands (previously partial cut)
2	Stands with no past management or stands needing conversion
3	Untreated young or second growth stands
4	Commercially thinned and fertilized stands
5	Pre-commercially thinned, commercially thinned, and fertilized stands.
6	Planted 1st generation genetic stock, no treatment

7	Planted 1st generation genetic stock, commercially thinned and fertilized
8	Planted 1st generation genetic stock, pre-commercially and commercially thinned, fertilized
9	Planted 2nd generation genetic stock, no treatment
10	Planted 2nd generation genetic stock, commercially thinned and fertilized
11	Planted 1st generation genetic stock, pre-commercially and commercially thinned, fertilized

The starting condition of each basic resource unit will vary according to the existing stand condition assigned to it. For example, some young stands will start at target stocking levels, while others will start at overstocked or understocked levels. Most present planning area acres are in Management Intensity 1 and Management Intensity 2; these acres will shift to different management intensities in the future as they are harvested and reestablished *within the model*.

For *multiple canopy* or *uneven-age* regimes the configuration is as follows:

<b>Management Intensity</b>	<b>Description</b>
12	Untreated stands projected without harvest entry
13	Growth trajectory and subsequent harvests of stand after the first harvest entry

These management intensities are applied to silvicultural regimes that are designed to enhance or protect ecological values, to deal with site factors that prevent even-age management, or to achieve resource management objectives in addition to timber production. These regimes include practices such as shelterwood retention, habitat connectivity regimes, and green tree retention regime.

Within multiple-canopy silvicultural regimes, harvests are designed to either remove entire diameter classes (canopy levels) or remove trees from all diameter classes in either small groups (group selection) or across entire stands (single tree selection). Such regimes do not contain the concept of a final harvest as described in traditional forestry, because a portion of the stand is always retained.

Specific treatment combinations (management intensities) are described in the managed stand yield tables completed for each sustained yield unit. Acres can be shifted from one management intensity to another during simulation in TRIM-PLUS runs.

**The ORGANON model and future yields.** Yields for stands that would be subject to management or that have already received management are estimated using the ORGANON model. Oregon Growth Analysis and Projection System (ORGANON) is a distance-independent, single tree, dynamic model used to project multiple species tree lists under various management practices and stand variables to estimate growth and yield. The model was developed by the Oregon State University based on data from southwestern Oregon. Site index, stand structure, fertilization, thinning, and stand density are some of the variables that ORGANON can use in making yield projections. ORGANON can project even-age or uneven-age stand characteristics and yields for both conifer and hardwood species.

The gross estimate of cubic volume output from ORGANON is adjusted for factors that are not considered in the model, such as defect and breakage, the effects of insects and disease, soil compaction, and the presence of non-stocked openings in the stands. Managed stand yield tables, published for each sustained yield unit and available at the Klamath Falls Resource Area office, provide greater detail on how these adjustments were completed.

Other information available from ORGANON outputs are useful to help characterize the differences between silvicultural systems. Such information includes species composition, stand structure, and crown closure.

## TRIM-PLUS Probable Sale Quantity Runs

When all of the acres, volumes, and management assumptions are assembled in the appropriate files in TRIM-PLUS, repeated probable sale quantity runs are made to find the optimal harvest level. Output summaries are reviewed to assure that outputs are correct and reasonable. After the total probable sale quantity run is completed, further analysis of the contribution to the harvest acreage by basic resource unit, resource area, or land status can be made.

The existing suitable commercial forest land is composed primarily of intact older forest stands, partially cut timber stands, and immature stands. Taken as a whole, this forest is capable of producing a particular level of annual growth without management and different levels of annual growth under the various silvicultural systems and practices.

In addition, the forest has a distribution of age classes (not necessarily even-age stands) that reflect both natural disturbance frequencies (such as wildfires) and past harvesting. The distribution of age classes is uneven, with different numbers of acres in each age class. As harvesting proceeds, a point is reached when average annual harvest and growth are in equilibrium. At this point the forest is said to be regulated and the maximum level of sustainable yield is being produced.

Various silvicultural regimes have the capacity to produce timber over time at a wide variety of harvest levels which might be higher or lower than that supported by current growth. To compute an allowable cut based solely on current growth would not permit either the accurate estimation of yield or the estimation of the effects of different silvicultural regimes or treatments. For that reason, the BLM uses an approach that projects growth into the future for the silvicultural system being analyzed.

For a particular general silvicultural system, the volume produced is highest if stands are harvested at a point called the *culmination of mean annual increment*, the age at which average annual volume produced by stands begins to decline. Since the age class distribution of the forest is uneven, if harvest occurred only at culmination of mean annual increment, then many acres would be available to harvest in some decades as those acres reached culmination of mean annual increment, and few acres would be available in other decades. A higher level of probable sale quantity is achieved if harvest in some decades is allowed to fall to a minimum harvest age below culmination of mean annual increment, although harvest at or near culmination of mean annual increment will occur in the long run (harvest will not fall to the minimum harvest age and stay there). Restricting harvest at various minimum harvest ages is tested for their effects on several factors, including the probable sale quantity.

### Allowable Cut Effect

Allowable cut effect is defined as the immediate increase in the current probable sale quantity which is justified by expected future increases in yields due to present or proposed management treatments.

The allowable cut effect may be produced if future growth rates exceed current growth rates. As the long term average growth rate increases, volume produced between the current and average growth rate may be scheduled for harvest. That portion of an probable sale quantity attributed to yields from increasing growth rates in the allowable cut effect. The probable sale quantity refers to a non-declining sustainable even-flow timber harvest over a long period of time.

Any silvicultural practice or management policy which affects implementation of practices, including harvest scheduling constraints, that increases or decreases the forest's average volume growth increment (growth rates) affects the potential sustainable harvest level. Harvesting stands with a slow growth rate compared to their site potential (usually mature stands which have a declining net growth rate) and replacing them with faster growing stands will, over a period of a few decades, increase the forests' average growth rate.

On a stand by stand basis, increasing growth rates are usually associated with silvicultural practices such as pre-commercial/commercial thinning, fertilization, or planting genetically-selected seedlings. Combinations of



these silvicultural practices may increase harvestable stand volumes by ten to twenty-five percent. Those treated stands can provide opportunities for commercial thinning or earlier regeneration harvest.

Management for non-timber values such as wildlife habitat enhancement have a wide range of effects on growth rates. Retention of late-successional stands, or conversion of fast growing stands to mature or late-successional stage stands, reduce current forest growth rates.

Allowable cut effect may be influenced by silvicultural practices that extend the period of maximum growth rates in natural or managed stands. Practices such as thinning can delay culmination of mean annual increment. The net effect is to maintain stands with high growth rates within the range of maximum value for longer periods. These conditions may balance out, maintain or slightly increase forest growth rates.

Realizing harvests that include the "Allowable Cut Effect" is dependent on a number of factors besides growth rates. The probable sale quantity is sensitive to a number of factors which include: existing stand conditions, age-size class distributions, land use allocations, wildlife habitat needs, management rules on proximity of harvest units, minimum harvest age, harvest scheduling restrictions, and the extent of investments in growth enhancing practices. The allowable cut effect occurs when all factors, applied in concert, result in an increase in future forest growth rates, and allow contributions to the probable sale quantity.

Probable sale quantity sensitivity tests were made to determine how much of the current probable sale quantity might be attributed to various levels of growth enhancing practices such as pre-commercial thinning, fertilization, and planting genetically-selected seedlings. Current forest conditions often limited allowable cut effects although future average forest growth rates were increased. An allowable cut effect was generally found where the slower growing (mature) stands were converted to faster growing stands. When factors affecting ten to fifty year stands such as their landscape locations, land use restrictions, or age-size class distribution cause a harvest volume gap, no allowable cut effect is possible for this decade. Likewise first or early decade harvesting of only stands growing at near maximum growth rates does not produce a measurable allowable cut effect.

Investments in growth enhancement practices should not be evaluated by the "current" allowable cut effect alone. The evaluation must also be based on: sustaining the potential enhancement of the average forest growth rate and economic guidelines for returns on growth and product quality. A recent Office of Inspector General Audit Report, No. 94-1-359, found forest development growth enhancing practices very cost effective in areas identified for traditional timber harvest, as well as in areas identified for habitat restoration where intermediate harvests, (commercial thinning and density management) are allowed.

Under the current plan, increases in the probable sale quantity level are projected in future decades. In most scenarios where harvesting is limited below the average-growth rate, harvestable inventory will accumulate. Combining past and present investments in growth enhancing practices, a more balanced better age-size class distribution is developing, and future harvestable inventory will accumulate and fill potential harvest gaps. In addition, the lengthening of rotations for wildlife habitat and other values provides some increased economic value production with larger stems.

## East Side Differences

Much of the above discussion on the TRIM-PLUS model and the probable sale quantity calculation process applies to the east side. However, major differences are as follows:

- ◆ The east side is not digitized as part of a geographic information system. Acres, by operations inventory unit, were calculated by use of dot grids. The level of analysis made possible by the geographic information system on the west side is not available on the east side.
- ◆ The number of inventory plots available on the east side was 29, a relatively small number.
- ◆ Empiric yield curves, based on 29 ten-point inventory plots, were used in conjunction with published yield tables for construction of yield curves projecting volume growth on east side stands. (The ORGANON model

was not used on the east side, since the database upon which ORGANON was built is in a different geographic region.)

- ♦ The same general silvicultural prescription was used to model Alternatives No Action, A, B, C, D, E, and the draft Resource Management Plan. The assumption was made that a multiple canopy/uneven-age silvicultural regime on the more xeric east side lands would provide an optimum level of timber production while retaining enough stand components to satisfy the needs of other resource values. The probable sale quantity would vary by alternative mainly with the number of acres available for forest management. For the Proposed Resource Management Plan, a similar prescription, but with a greater emphasis on underthinning and old growth retention, was used.

## Adjustments to KFRA TRIM-PLUS Acres

In the Lakeview District's portion of the Klamath Sustained Yield Unit there are many uneven-age stands that are typically comprised of small patches varying in size, species, and age. Therefore the timber types that TRIM-PLUS proposes to harvest only occur in patches in the harvest unit and not evenly dispersed throughout the entire harvest unit (see Figure V-1). The result is that the total acres of the harvest unit entered would be significantly higher than the TRIM-PLUS estimates of acres that would actually be cut. In addition, the volume per acre that would be harvested at the stand level would be lower than the TRIM-PLUS outputs. Due to this situation, TRIM-PLUS acres for the Klamath Falls Resource Area have been adjusted based on last decades harvest levels, current harvesting levels, and professional judgement to reflect a more realistic harvest acreage associated with the TRIM-PLUS harvest levels (probable sale quantities) for the alternatives.

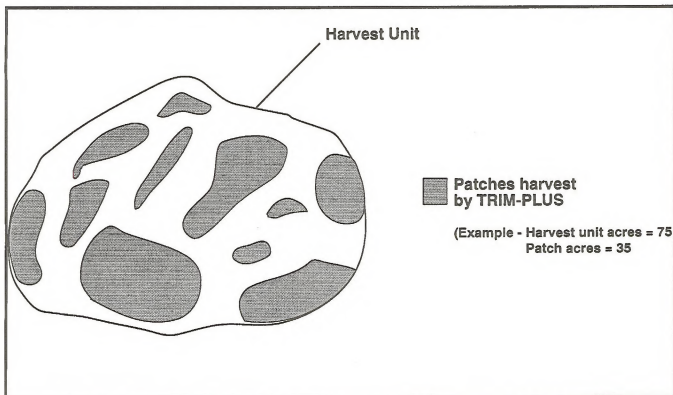


Figure V-2. Harvest patches by TRIM-PLUS



# Appendix W

## Effects on Timber Management

### Timber Supply Analysis For BLM Planning

#### Background

In 1992, the U.S. Department of the Interior Bureau of Land Management (BLM) released draft environmental impact statements for the Coos Bay, Eugene, Medford, Roseburg, Salem, and Klamath Falls Resource Area - Lakeview District Draft Resource Management Plans. These drafts included a comprehensive analysis of timber supply in western Oregon. The analysis covered a period of initial plan implementation (1991-2000) and the period thereafter (2001-2010). The baseline period that provides a historical benchmark for comparison was 1984-1988.

Details of the original analysis are described in the draft EISs (Anonymous, 1992). Regional stumpage price results were used to calculate price changes for the assessment of personal income, employment, and population effects. Harvest and log consumption results are presented in chapter 4.

#### Key Concepts

Implemented on all Districts, each set of similar resource management plan alternatives represented a different timber supply policy, or alternative theme, for BLM-administered lands in western Oregon. The question being addressed by this analysis is how do changes in BLM timber supply policy affect how much timber is harvested and consumed in various parts of western Oregon? Western Oregon was divided into subregions that differed in ownership distribution, private timber availability, and silvicultural management, while at the same time served as logical reporting areas for western Oregon BLM Districts. Changes in one subregion could affect another through the transportation of logs from harvest origin to processing destination. The analysis recognized that the BLM is just one timber supplier within western Oregon and that the impact of harvest changes is felt where the timber is actually consumed. The amount of timber offered for sale by the BLM affects stumpage price. In turn, stumpage price influences private timber harvest. The lower the BLM sale quantity, the higher stumpage prices, and the higher the level of private timber harvest.

Timber demand is determined by factors outside the control of the BLM such as housing starts and other national economic variables like gross domestic product and the interest rate. Year to year fluctuations in timber demand were averaged over a ten year period. Timber supply is determined by ownership, location, and stand condition. Ownership determines the policy specifying the conditions under which the timber may be harvested. Location accounts for variations in species composition and the amount of timber available for harvest. Stand condition measures the amount of harvestable volume available on a per acre basis, as well as the growth rate and stage of development of this volume. Private timber harvest is directly proportional to stumpage prices. This analysis accounted for changes in private timber supply by assessing inventory conditions at the beginning of each analysis period. For public agencies such as the U.S. Department of Agriculture Forest Service and the BLM, timber supply is fixed at the planned allowable sale quantity; regardless of the stumpage price.

Market equilibrium defines a balance between timber supply and demand: the amount of timber harvested equals the amount of timber consumed at the market clearing price. Implementing a new BLM timber policy will disrupt this balance and leads to adjustments in the stumpage price such that a new timber supply and demand balance

## Appendix W - Effects on Timber Management

is created. In this analysis, market equilibrium is explicitly recognized for the Pacific Northwest - westside region, and this implies a local equilibrium within each western Oregon subregion.

## Updated Procedures

As was the case in 1992, the analysis consisted of the following steps for the 1991-2000 period<sup>1</sup>: (1) regional market equilibrium, (2) disaggregation of the private harvest, (3) timber harvest by ownership, (4) reapportioning harvest into log consumption; and for the 2001-2010 period, (5) updating the private inventory, projecting the private harvest, and re-estimating log consumption.

Timber Assessment Market Model (Adams and Haynes 1980, Haynes 1990) run<sup>2</sup> results for the 1992 analysis indicated a linear relationship between private timber supply and BLM alternative sale quantity (Anonymous, 1992). This analysis relied on interpolating the results from two updated Timber Assessment Market Model runs representing Federal timber supply levels of 187 million cubic feet per year (mmcf/year) and 322 mmcf/year respectively. The first run<sup>3</sup> corresponds to the Resources Planning Act base run used to evaluate the Forest Plan for *Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl*. The second run<sup>4</sup> represented an arbitrarily set higher level of Federal timber supply. The interpolations were based on changes in the BLM share of the Pacific Northwest - west side Federal timber supply for the alternative theme being analyzed. National Forest harvest levels were held at their level in the 1994 Resources Planning Act base run (93 million cubic feet/year). The other public harvest for the Pacific Northwest - westside supply region was left unchanged at 147 million cubic feet/year.

When compared to the base run used in the 1992 analysis<sup>5</sup>, the April 1994 Resources Planning Act Timber Assessment Market Model base run included several updates relevant to the Pacific Northwest - westside supply region<sup>6</sup>. The most relevant was an overall reduction in private timber supply due to inventory updates. This had the effect of lowering Timber Assessment Market Model's estimate of private growing stock removals given similar policy and economic conditions used in the 1992 analysis. Other Timber Assessment Market Model updates included revisions in historical input data for revised estimates of the proportion of sawtimber volume from growing stock removals. Observed harvest values for the years 1991 and 1992 replaced estimates used in the 1992 analysis.

The procedures and assumptions used to complete steps (2) - (5) above remained the same as those used in the 1992 analysis (Anonymous 1992).

## Results and Discussion

Results are presented in Tables W-1 to W-3. When compared with the 1992 analysis, the results indicate an overall lower level of private timber supply under higher stumpage price levels. The higher stumpage prices reflect the markedly lower level of timber supply from National Forests. In the 1992 analysis, National Forests were held at a supply level of 240 million cubic feet/year (consistent with their proposed plan modifications under the Interagency Scientific Committee conservation strategy for the northern spotted owl). However, under implementation of the President's Forest Plan, the National Forest timber supply is reduced to 93 million cubic feet/year. In spite of this price increase, the level of private harvest is lower than estimated in the 1992 analysis. This reflects the private inventory updates in Timber Assessment Market Model.

<sup>1</sup> See Anonymous (1992) for a detailed description of each step.

<sup>2</sup> TAMM90 log runs 582, 583, 584, and 587.

<sup>3</sup> Timber Assessment Market Model - 1993 Montana Version, LR-207 (RPA-Base, 4/14/94).

<sup>4</sup> Timber Assessment Market Model - 1993 Montana Version, Log Run CT2, June 24, 1994.

<sup>5</sup> TAMM90, Log-Run 581, April 9, 1992.

<sup>6</sup> R. Haynes, and J. Mills. Social and Economic Values Research Program, USDA Forest Service, Pacific Northwest Research Station, Portland Forestry Sciences Laboratory, PO Box 3890, Portland, Oregon, 97208.

When compared to the 1984-1988 baseline, the private harvest under each BLM alternative theme increases over 1991-2000. This can be attributed to increases from the non-Industrial private ownership. Comparison of the 2001-2010 projections with the 1991-2000 harvest disaggregation shows a dramatic increase in the total private harvest, over 130 million cubic feet per year. One important qualification for this harvest gain is that pre-1990 forest practice rules and related environmental constraints on the private timberlands remain unchanged through 2010. Therefore, these increases may not be entirely attainable given recent changes in Oregon forest practice regulations for stream protection and proposed conservation restrictions on private lands for the marbled murrelet, northern spotted owl, and possibly coho salmon.

Western Oregon was a net importer of logs over the 1984-1988 period as total consumption exceeds harvest. This was not allowed to vary in this analysis. Differences in log consumption across BLM resource management plan alternatives were less noticeable given the large share of timber harvest still forthcoming from all other ownerships. For all BLM resource management plan themes, log consumption in western Oregon is projected to decrease when compared to the 1984-1988 baseline period. Most of this decrease is from reduced National Forest allowable timber sale quantities under the President's Forest Plan and TAMM reductions in private timber availability. Private harvest increases in the 2001-2010 period translate into higher levels of consumption for this period.

**Table W-1. Regional Market Equilibrium Results by BLM Resource Management Plan Theme.**

<u>Bureau of Land Management</u>		<u>Timber Supply Analysis Results</u>	
<u>Resource Management Plan Theme</u>	<u>Probable Sale Quantity (mmcf/year)</u>	<u>1991-2000 Regional Stumpage Price (1982 \$/mbf)</u>	<u>1993-2000 Western Oregon Private Growing Stock Removals (million cubic feet per year)</u>
1984-1988 Historical	199	\$112.42	602
NO ACTION	187	\$255.63	618
A	250	\$250.41	610
B	224	\$252.53	613
C	67	266.05	635
D	74	\$264.94	633
E	56	\$267.07	637
PRMP	35	\$268.86	640
TAMM LR-207	94	\$263.64	631
TAMM LR-CT2	136	\$251.85	612

mbf - thousand board feet, long log scale.  
mmcf/year - million cubic feet per year.  
TAMM - Timber Assessment Market Model

Table W-2. Results for the 1993-2000 Private Harvest Disaggregation and 2001-2010 Harvest Projections.

BLM Resource Management Plan Theme	Private Harvest, Western Oregon (million cubic feet per year)					
	IND	1993-2000 NIPF	TOTAL	IND	2001-2010 NIPF	TOTAL
PRMP (BLM PSQ = 35)	465	175	640	558	213	771
No Action (BLM PSQ = 187)	449	169	618	549	208	757
Alternative A (BLM PSQ = 250)	443	167	610	545	206	751
Alternative B (BLM PSQ = 224)	446	168	614	547	207	754
Alternative C (BLM PSQ = 67)	461	174	645	556	212	768
Alternative D (BLM PSQ = 74)	460	174	634	555	211	766
Alternative E (BLM PSQ = 56)	462	175	637	556	212	768
Timber Availability <sup>(1)</sup> (BLM PSQ = 190)	544	125	669	557	125	682
	<u>IND</u>	<u>NIPF</u>	<u>TOTAL</u>			
1984-1988 Baseline (BLM Harvest = 202)	525	77	602			

Notes: PRMP - Proposed Resource Management Plan  
 IND - Private industrial ownership.  
 NIPF - Private non-industrial ownership.  
 BLM PSQ - Bureau of Land Management resource management plans cumulative allowable sale quantity for western Oregon (million cubic feet per year). Includes the Klamath Falls Resource Area of the Lakeview District.

BLM Harvest - Bureau of Land Management actual harvest (million cubic feet per year).

<sup>(1)</sup> Sessions, John., coordinator. 1990. Timber for Oregon's tomorrow. The 1989 update. Corvallis, OR. Oregon State University, College of Forestry, Forest Research Lab. 183 p.

**Table W-3. Log Consumption Results by BLM Resource Management Plan Theme.**

BLM Resource Management Plan Theme	Log Consumption by Western Oregon Processing Facilities (million cubic feet per year)							
	<u>1993-2000</u>				<u>2001-2010</u>			
	HARV	END CNSMP	EXOG CNSMP	TOTAL CNSMP	HARV	END CNSMP	EXOG CNSMP	TOTAL CNSMP
PRMP	797	761	97	858	928	882	97	979
No Action	929	890	98	987	1,067	1,018	98	1,115
Alternative A	982	942	97	1,039	1,123	1,072	97	1,170
Alternative B	961	922	97	1,019	1,101	1,051	97	1,148
Alternative C	825	789	97	886	958	911	97	1,008
Alternative D	831	794	97	892	964	917	97	1,014
Alternative E	816	779	97	876	947	900	97	997
1984-1988 Baseline	1,248	1,196	98	1,294				

Notes: PRMP - Proposed Resource Management Plan  
 HARV - Total harvest from all ownerships within western Oregon (million cubic feet per year).  
 END CNSMP - Consumption of logs originating from ownerships within western Oregon (million cubic feet per year). The difference between HARV and END CNSMP represents the volume of timber originating in western Oregon, but processed by out-of-state or eastern Oregon mills.  
 EXOG CNSMP - Consumption of logs originating from ownerships from eastern Oregon and out-of-state (million cubic feet per year). Differences reflect the effect of implementing different BLM resource management plan alternatives on Klamath Resource Area of the Lakeview District in eastern Oregon.  
 TOTAL CNSMP - Total log consumption (all origins) by western Oregon processing facilities (million cubic feet per year).

## **Effects of Silvicultural Practices and Silvicultural Systems on Wood Quality, Timber Yields, and Economic Value**

This appendix describes the effects of intensive silvicultural practices on wood quality, timber yield and economic value, alone and sequenced together in silvicultural systems.

A variety of silvicultural practices are employed in the management of forest stands. The Bureau of Land Management (BLM) in western Oregon classifies precommercial thinning, commercial thinning, forest fertilization and pruning as intensive silvicultural practices. These practices are applied to forest stands to meet management objectives such as controlling species composition, controlling stand density and promoting growth and/or quality characteristics of selected trees. Intensive practices are usually scheduled in a sequence, that is within a silvicultural system or prescription over the course of a planned rotation.

Wood quality is defined as the suitability of the material for a particular use and is determined from both the characteristics of trees (tree form, ring width, limbliness, and percent of juvenile wood) and from the physical properties of wood (specific gravity, fibril angle, and permeability). Log or tree size alone does not affect quality, but larger trees generally have more clear (knot free) wood and a smaller portion of the tree in juvenile wood.

Timber yield is defined as the total amount of merchantable wood produced over a rotation that is actually harvested. It is usually measured in cubic feet or board feet. Yields in this appendix are expressed in net cubic foot volumes or change in cubic volume.

Economic value is defined as the monetary worth of individual timber products or the net return on investment for individual practices or sequence of practices. The quantity and quality of timber harvested and the timing of costs and revenues affect economic value.

### **Effects of Individual Silvicultural Practices**

This section describes the effects of forest management actions on timber yields, wood quality and value in the case of pruning.

Uniformity and rate of growth affect the machinability and appearance of lumber. Rate of growth is a limiting factor in high-quality structural grades of lumber. Wood must have no less than four rings per inch to meet the criteria for select structural lumber. Specialty items such as scaffolds, joints, and beams must average more than six rings per inch. However, analysis of past problems with the strength of wood from managed stands has indicated that the problems were caused by the percent of juvenile wood, rather than growth rate. In Douglas-fir, juvenile wood occupies the first 15 to 25 rings. A higher proportion of juvenile wood could be expected for stands managed on short rotations. Effects on timber yield from individual silvicultural practices vary depending on the timing and intensity of treatment whether treatment is solitary or in combination with other practices.

### **Thinning**

Thinning is a silvicultural practice used to meet stand density, species composition and stand diversity objectives. Thinnings conducted prior to the time trees are considered to be of nominal merchantable size are called precommercial thinnings. Thinnings that remove merchantable products are designated commercial thinnings.

The principal effect of precommercial thinning is to permit earlier harvest through development of larger log sizes, increase the percent of stand volume on desired species, create stand densities and size distributions conducive to commercial thinning or other objectives. Precommercial thinning can permit greater realization of yield benefits from genetic improvement and forest fertilization by redirecting growth potential to crop trees only. To be fully effective, precommercial thinning must be scheduled at the correct time in a stand's development (Reukema 1975). This is usually before growth retardation or stand differentiation occur.



Commercial thinnings are timber harvests scheduled any time after a stand reaches a combination of stem diameter and surplus volume which permit an economical harvest. Commercial thinning can be effective in increasing recoverable timber yields by harvesting trees which would otherwise die prior to the final regeneration harvest in stands as old as 150 years (Williamson and Price 1971, Williamson 1982). Heavy commercial thinning shows the ability to accelerate the development of old-growth stand characteristics in current even-aged stands (Newton and Cole 1987).

For both types of thinning, the primary effect on wood quality are changes in the limb characteristics of trees. Thinning increases limbliness and lengthens the time dead limbs adhere to the bole. Knots and the distorted wood around them reduce wood strength and the yield of wood graded for appearance (selects and shop grades). Thinning increases the proportion of younger stems which are in juvenile wood. These effects were described in Maguire et al. (1991). Low post-thinning densities can negatively affect timber yield by not maintaining enough trees to take advantage of full site growth capacity in the short term (Curtis and Marshall 1986). Extremely low post-thinning densities can negatively affect wood quality through excessive taper and slope of wood grain and through production of wide growth rings.

## Fertilization

Fertilizer is applied to forest stands to offset limiting amounts of soil nutrients, particularly nitrogen. Fertilization treatments are usually scheduled with thinning treatments and are spaced 10 to 15 years apart.

Fertilization has the effect of accelerating stand development and increasing timber yields (Miller, Glendenen, and Bruce 1988). Since fertilizer increases individual tree vigor and the rate tree crowns expand, it has been observed to reduce thinning shock, accelerate release and overcome damage from insects and drought. Fertilization tends to increase ring width and decrease wood specific gravity by an average of 5 percent (Megraw 1986). However, this is not thought to have a significant effect on wood quality. Fertilization increases piece size. Treatment can be timed to improve the ratio of mature wood to juvenile wood and after pruning to improve the production of a clear wood core.

## Pruning

Pruning is carried out to improve wood quality through the production of clear wood on rotations shorter than what would be required without the action. Pruning helps to avoid the production of wood with loose knots. Pruning is essential to insure the production of significant amounts of clear wood in intensively managed stands of Douglas-fir under normal even-aged management and short rotations (Cahill et al. 1988) (Fight et al. 1988). Pruning may also have benefits in meeting structural diversity objectives and decreasing fire hazard in areas with short natural fire return intervals. Pruning appears to be necessary to produce significant wood of acceptable quality from lower density stands (Briggs and Fight 1992).

Results of an analysis by the Medford BLM district on product value increase from pruning is shown in Figure W-1 and Table W-4.

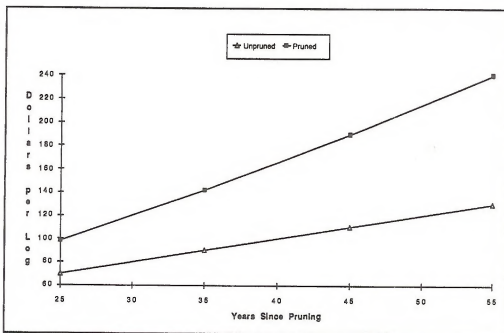


Figure W-1. Value of Ponderosa Pine Logs (pruned vs. unpruned)

Table W-4. Effect of Pruning on Douglas-fir Wood Quality.

Harvest Age	Percent Select Lumber		Unpruned	Value of Logs		Gain in NPV
	Unpruned	Pruned		Unpruned	Pruned	
60	0%	35%		\$82	\$110	\$4.25
100	0%	51%		\$130	\$188	\$0.36

NPV = net present value using a 4% discount rate.

A financial analysis of pruning of Douglas-fir and ponderosa pine was done by Fight, Bolon and Cahill 1993). Break-even cost of pruning pine is shown in Figure W-2 using estimates of future wood prices and a 4 percent real interest rate for site index 55 and for site index 80, with and without commercial thinning.

Pruning can decrease timber yields if a significant portion of the live tree crown is removed (O'Hara 1991). The BLM does not propose levels of live crown removal that are likely to impact timber yields. The BLM pruning operations are expected to have a neutral effect on timber yields.

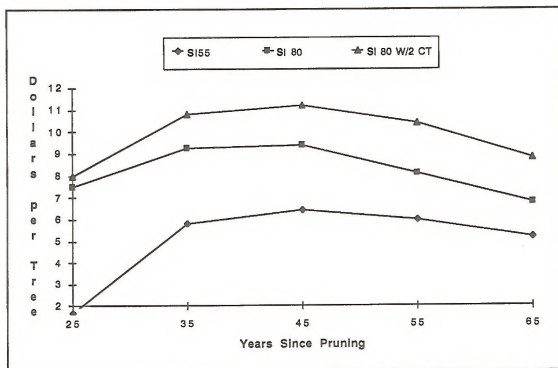


Figure W-2. Breakeven Cost of Pruning Ponderosa Pine (for Different Site Qualities With & Without Commercial Thinning).

# Effects of Silvicultural Systems

This section summarizes the results of an analysis of timber yield and wood quality effects on economic return for selected silvicultural systems proposed for the Proposed Resource Management Plan. Silvicultural systems affect wood quality, timber yields and economic return by changing tree and stand growth patterns and the magnitude of discounted costs and benefits. The silvicultural systems analyzed are representative of management regimes proposed for the next decade on BLM lands classified as Northern General Forest Management Areas. This single analysis is intended to portray results which reflect average stand conditions and average response to treatments on a statewide basis for BLM managed lands in western Oregon. These silvicultural systems will vary somewhat within and between districts but, are representative enough to display relative effects of similar silvicultural systems.

Effects of the different management practices and combinations are depicted as percent change in timber yield, percent change in net present value, benefit cost ratios, and value per cunit (100 cubic feet) of timber yield.

## Silvicultural Systems Analyzed

Table W-5 describes the various silvicultural systems analyzed. Analysis was limited to silvicultural systems incorporating precommercial thinning, commercial thinning, forest fertilization and pruning compared to a base prescription which represents an overstocked stand with no treatments until a final regeneration harvest.

**Table W-5. Summary of Silvicultural Prescriptions Analyzed.**

Silvicultural System	Description
BASE	Overstocked (overdense) stand averaging 680 trees per acre at age of establishment. Final regeneration harvest at age 60 or 100.
PCT	Overstocked stand; precommercially thinned at age 12 to 250 trees per acre. Final regeneration harvest at age 60 or 100.
PCT/FERT	Overstocked stand; precommercially thinned at age 12 to 250 trees per acre. Fertilizer applied at ages 30 and 45. Final regeneration harvest at age 60 or 100.
PCT/CT <sup>1</sup>	Overstocked stand; precommercially thinned at age 12 to 250 trees per acre. Commercial thinning at age 45. Final regeneration harvest at age 60.
	Overstocked stand; precommercially thinned at age 12 to 250 trees per acre. Commercial thinning at ages 45 and 65. Final regeneration harvest at age 100.
PCT/FERT/CT <sup>1</sup>	Overstocked stand; precommercially thinned at age 12 to 250 trees per acre. Fertilizer applied at ages 30 and 45. Commercial thinning at age 45. Final regeneration harvest at age 60.
	Overstocked stand; precommercially thinned at age 12 to 250 trees per acre. Fertilizer applied at ages 30 and 45. Commercial thinning at ages 45 and 60. Final regeneration harvest at age 100.

<sup>1</sup> Silvicultural systems with two descriptive approaches are dependent on assumed rotation lengths. Variations in exact timing of practices will vary by district.

## Analytical Assumptions

Following are the specific assumptions made in the analysis.

1. Difference in site productivity can significantly affect yields and financial returns (Koss and Scott 1978). BLM in western Oregon manages twelve planning units designated as Sustained Yield Units. Site quality is variable both within and between sustained yield units. Due to the complexity of trying to analyze each sustained yield unit separately, the Douglas sustained yield unit of the Roseburg District was selected as representative for BLM administered lands in western Oregon. Average productivity expressed as site index for this sustained yield unit is 100 using Hann-Scrivani site index curves (Hann and Scrivani 1987). Site Index 100 is the approximate mid-point of average site indexes used by the westside BLM districts for decadal planning purposes in estimating timber yields.
2. The costs for stand establishment treatments were derived from 1989 Roseburg BLM District contract cost data sources weighted by the percent of acres receiving the treatment. Logging and hauling costs were derived from tabular information compiled by the Medford BLM District for general westside BLM use in feasibility analysis for resource management planning.
3. An inflation rate of zero (0) and no future real increase in wood value was assumed. A discount rate of 4 percent was used.
4. The costs of establishing the current stand were not included in this analysis. However, the costs of establishing the next stand were included at the end of the assumed rotations. This convention is consistent with economic analyses done previously for BLM planning purposes in western Oregon.
5. Comparisons of effects were made at rotation (regeneration harvest) ages of 60 and 100 years depending on silvicultural system. Sixty years represents probable average statewide minimum rotation ages for the BLM. One hundred years represents the probable average BLM rotation age if culmination of mean annual increment is used as the rotation age criteria. (Curtis 1992, Curtis and Marshall 1993).
6. Intangible or intrinsic values (Smith 1987) such as the potential value of practices for meeting non-timber objectives were considered beyond the scope of the analysis.
7. Pruning analysis was performed using the addition of select pricing for lumber grades and veneer market. Pruning of the first 17.5 feet (16 foot merchantable log) is assumed to occur at age 25.
8. All gross yield outputs from SWO-Organon were reduced for stocking irregularity, insects and disease, defect and breakage and effects of green-tree retention at a level of 7 large conifers per acre.
9. Timber products harvested were assumed to be a mixture of lumber and veneer. Lumber prices used in TreeVal+ were derived by taking 1989 Table 9 figures shown in Warren (1993). TreeVal+ veneer prices were derived from reviewing Random Lengths publications (Nov. 1992 - Aug. 1993). The use of 1993 veneer pricing instead of associated 1989 values was required due to the lack of readily available data sources.

## Analytical Models

Future timber yields and wood quality tree characteristic outputs for managed stands were obtained from simulations using the System-1 young stand model, Version 1.8 (Ritchie et al. 1991) and the SWO-Organon growth and yield model Version 4.0 (Hann et al. 1992).

System-1 is an individual tree, distance-independent growth model. It is suitable for growing trees from a minimum of three years of age up to an age (15-20+ years) compatible with entry into growth models suitable for older stands such as SWO-Organon.

SWO-Organon is an individual tree, distance-independent growth and yield model. It was developed from sampling plots located in the mixed conifer zone of southwestern Oregon. The model was developed primarily to simulate the growth and timber yield of Douglas-fir and mixed conifer stands. The model was designed to allow projections of both even-aged and uneven-aged stand conditions under different silvicultural systems.

Wood value and economic analysis were analyzed using the TreeVal+ (Sachet et al. 1989), DF Prune (Fight et al. 1992), and Forestry Investment Program (Ikaheimo 1990) models. The first two programs provide product recovery plus value data and partial cost data to the third model for an integrated economic analysis.

TreeVal+ is an analysis program which calculates tree or stand values based on predicted product recovery. TreeVal+ is appropriate for natural stands or managed plantations. Values of products harvested under the different regimes simulated were obtained from the TreeVal+ program.

DF Prune is a spreadsheet program designed to estimate the financial return from pruning coast Douglas-fir. Values of products harvested under regimes where pruning is simulated were obtained from the DF Prune program.

The Forestry Investment Program is a financial analysis program specifically developed for the economic evaluation analysis of silvicultural regimes. Forestry Investment Program utilizes data inputs from SWO-Organon, TreeVal, DF Prune and other sources in calculations of net present values. The analysis can be structured to account for inflation, cost changes and product value changes over time.

## Results of Silvicultural Systems Analysis

Table W-6 show the effects on timber yield and economic returns for the different silvicultural systems for rotation ages of 60 and 100 years after stand initiation. Wood quality change is not directly displayed but is expressed in the economic measures.

**Table W-6. Comparison of Yield Changes & Economic Returns for a 60 and 100 Year Rotation.**

Silvicultural System	% Change In Cubic Volume	Net Present Value (NPV)	% Change In NPV	Benefit/Cost Ratio	Value Per Cunit
<b>60 Year Rotation</b>					
BASE		\$301		1.38	\$3.78
PCT	+7%	\$530	+76%	1.68	\$6.21
PCT/FERT	+13%	\$611	+103%	1.72	\$6.78
PCT/CT	+15%	\$497	+65%	1.49	\$5.43
PCT/FERT/CT	+21%	\$677	+125%	1.62	\$7.04
PCT/PRUNE	+7%	\$713	+137%	1.71	\$8.35
<b>100 Year Rotation</b>					
BASE		\$470		3.04	\$3.47
PCT	+2%	\$526	+11%	2.74	\$3.80
PCT/FERT	+5%	\$532	+13%	2.57	\$3.75
PCT/CT	+17%	\$625	+32	1.86	\$3.84
PCT/FERT/CT	+20%	\$716	+52%	1.88	\$4.39
PCT/PRUNE	+2%	\$539	+15%	2.37	\$3.90

- Notes:
- ◆ Percentage change in cubic volume is the increase in volume above that produced by base prescription (overstocked stand condition).
  - ◆ Net present value is calculated by subtracting discounted costs from discounted benefits.
  - ◆ Percentage change NPV is the percentage of net present value increase or decrease compared to the net present value of the base prescription.
  - ◆ Benefit cost ratio is calculated by dividing discounted benefits by discounted costs.
  - ◆ Value per cubic foot = Total NPV divided by total yield of all harvests in cunits (100 cubic feet).

## Appendix W - Effects on Timber Management

Percent change in cubic volume is the net timber yield increase above that of the base silvicultural system expressed as percent of net conifer cubic volume. Net present value is calculated by subtracting discounted costs of producing timber from the discounted revenues from harvest. Percent change in net present value is the change in net present value relative to the net present value of the base silvicultural system. The benefit cost ratio depicts total discounted revenues divided by total discounted costs.

Value per cunit (100 cubic feet) is a simple relationship between total net revenues gained from a set of practices and the total net timber yield. The ratio allows interpretation of how each silvicultural practice functions to positively or negatively affect quantity (volume production) and/or quality (additions to value) of products produced.

Table W-7 shows a comparison of two qualities influencing wood quality; average diameter at final harvest and average rings per inch.

**Table W-7. Selected Tree Characteristics Which Affect Wood Quality.**

Silvicultural System	60 YEARS		100 YEARS	
	Average DBH	Rings per Inch	Average DBH	Rings per Inch
BASE	11"	11	16"	13
PCT	15"	8	20"	10
PCT/FERT	16"	8	21"	10
PCT/CT	17"	7	23"	9
PCT/FERT/CT	18"	7	24"	8
PCT/PRUNE	15"	8	20"	10

All silvicultural systems showed an increase in timber yield above the base at both rotation ages analyzed. Gains were similar at both ages for silvicultural systems which included commercial thinning. The commercial thinnings harvest trees which would otherwise die before final harvest and would not be recoverable as usable products (Smith 1962, Reukema and Bruce 1977). Those silvicultural systems that did not include commercial thinning did not recover this mortality and therefore showed a decline in percent yield increase at 100 years.

All silvicultural systems showed a positive economic return at both rotation ages simulated. All tested combinations of practices produced higher levels of economic return than the base level alone. Economic returns are greater for all systems for the 60 year rotations.



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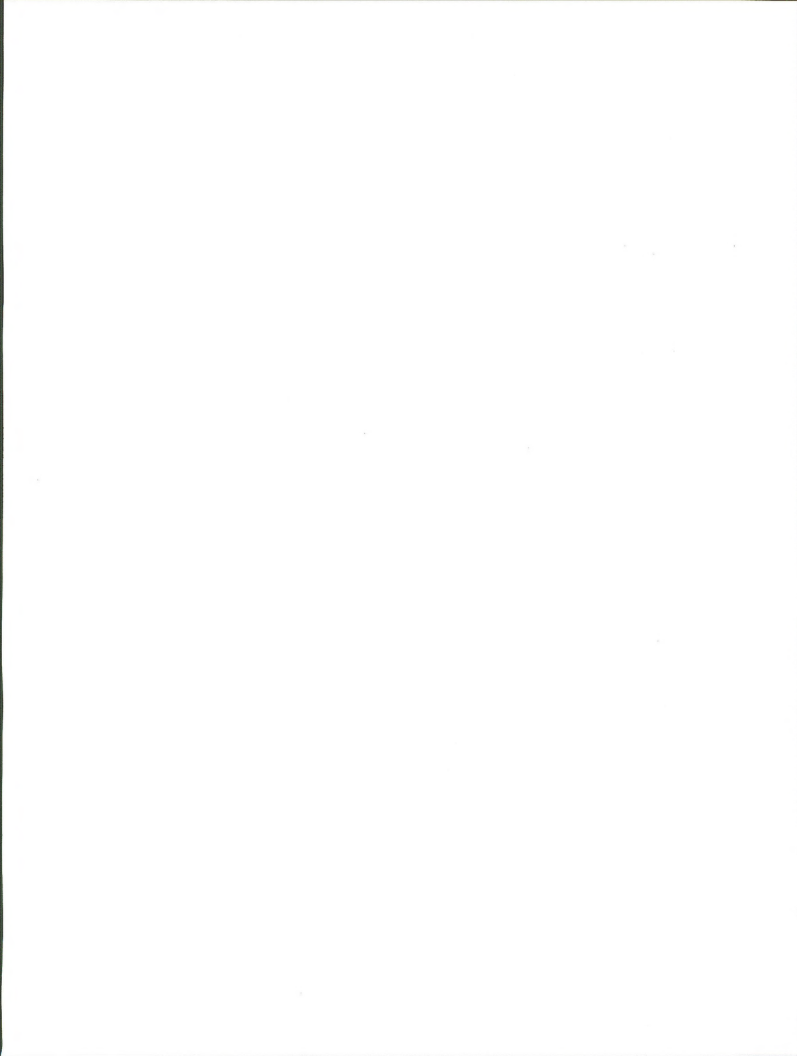
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# Appendix X

## Consistency with Other Agency Plans and Programs

BLM planning regulations require that Resource Management Plans be consistent with officially approved or adopted resource-related plans and the policies and procedures contained therein, of other federal agencies, state and local governments, and Indian tribes, so long as the guidance and Resource Management Plans are also consistent with the purposes, policies and programs of federal laws and regulations applicable to public lands..." (43 CFR 1610.3-2). Consistency is construed as the absence of conflict. Based on BLM's knowledge of the plans of such other agencies, the proposed Resource Management Plan has been compared to the following agencies' plans, for consistency, and BLM has reached the conclusions stated.

### Federal Agencies

The Proposed Resource Management Plan is believed to be consistent with the following plans of other federal agencies:

- ◆ The Record of Decision on the 1994 *Supplemental Environmental Impact Statement on Management of Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of the Northern Spotted Owl*
- ◆ The Forest Service's forest-wide land use plans for the adjacent National Forest(s)
- ◆ Soil Conservation Service watershed plans
- ◆ The Coastal Barrier Improvement Act of 1990 and draft (proposed) Pacific Coastal Barriers Study for areas under consideration for inclusion in the Coastal Barriers Resource System, as administered by the U.S. Fish and Wildlife Service.
- ◆ The Endangered Species Act and the following Fish and Wildlife Service plans (see Effects on Threatened and Endangered Species):
  - ◆ Pacific Bald Eagle Recovery Plan
  - ◆ Final Draft Northern Spotted Owl Recovery Plan
  - ◆ Fish and Wildlife Service determination of critical habitat for the northern spotted owl
  - ◆ Pacific Coast Recovery Plan for the Peregrine Falcon
  - ◆ Recovery Plan for the Lost River and Shortnose Suckers.
- ◆ The National Park Service's Nationwide Rivers Inventory (see Effects on Wild and Scenic Rivers)
- ◆ The Bonneville Power Administration's latest annual Transmission System Facilities Resource Program
- ◆ The Northwest Power Planning Council, Columbia River Basin, Fish and Wildlife Program and subordinate species-specific strategies.

## **State Government**

The Proposed Resource Management Plan is believed to be consistent with the following plans, programs, and policies of State of Oregon agencies:

- ◆ Department of Environmental Quality (see Effects on Air Resources)
  - ◆ Smoke Management Plan
  - ◆ Visibility Protection Plan and air quality policies
  - ◆ Prevention of Significant Deterioration requirements
- ◆ Water Resources Department river basin programs for the Klamath River
- ◆ Water Resources Commission rules and statutes
- ◆ Department of Human Resources, Health Division, standards for public water systems
- ◆ Department of Agriculture
  - ◆ Weed control plans
  - ◆ State-listed endangered plant species (see Effects on Special Status Species)
- ◆ Division of State Lands
  - ◆ Removal - Fill Law
  - ◆ Natural Heritage Program (See effects on Special Areas)
- ◆ Parks and Recreation Department
  - ◆ Statewide Comprehensive Outdoor Recreation Plan (see Effects on Recreation).
  - ◆ State Parks and Recreation System Plan
  - ◆ State Recreation Trails Plan (see Effects on Recreation)
  - ◆ State Historic Preservation Program
  - ◆ State Scenic Waterways Program and related projects.
- ◆ Department of Transportation, Highway Division
  - ◆ Oregon Highway Plan
  - ◆ Six Year Highway Improvement Plan
- ◆ Economic Development Department, Regional Economic Development Strategies

Consistency of the alternatives with some other State plans and programs is more complex, as described in the following discussions.

Consistency with the Department of Environmental Quality's Statewide Water Quality Management Plan (including Water Quality Standards and Guidelines) and the State's antidegradation policy would vary by watershed analyzed. The cumulative effects of timber harvest activities on BLM-administered lands plus other ownerships could lead to violation of the state's antidegradation policy in one or more of the watersheds analyzed unless either private activities are less than anticipated (by the BLM) or the BLM can lessen the cumulative impacts by scheduling its timber sales to occur at different periods than most of the anticipated private timber harvest.

Consistency with the Department of Fish and Wildlife's many plans, policies, rules and objectives is addressed later in this appendix.

Consistency with the Board of Forestry's Forestry Program for Oregon is complex, due to the diversity of goals of the Forestry Program for Oregon. Specificity regarding consistency with the five Forestry Program for Oregon objectives is also provided later in this appendix.

The proposed plan would be consistent with the Oregon Benchmarks (Report to the 1993 Legislature by the Oregon Progress Board, December 1992) for water, forest land, wetlands, fish and wildlife, and outdoor recreation.



It would not, however, be likely to support reaching the 1995 and 2000 benchmarks for increasing standard of living, affordable housing, family stability, and stable home life.

Consistency with the statewide planning goals and guidelines administered by the Land Conservation and Development Commission through the Department of Land Conservation and Development is variable among the goals for which resource area BLM plan consistency is relevant. Oregon's land use program was enacted 21 years ago. Today a complex body of land use policy and goal interpretations exists due to the acknowledgment process, goal amendments, Land Conservation and Development Commission rule making, and Land Use Board of Appeals and appellate court decisions. The matter of BLM consistency with the statewide goals involves a number of interrelated issues of policy, intergovernmental coordination and state and federal legal requirements. Consistency with these goals is characterized generally later in this appendix.

The statewide planning goals are legally binding on all planning activity relating to land use undertaken by cities, counties, special districts, and state agencies. The planning goals function similarly for affected federal agencies making consistency determinations under the Oregon Coastal Management Program in accordance with the (Federal) Coastal Zone Management Act. All applicable local government plans have been acknowledged by the Land Conservation and Development Commission to be in conformance with the Coastal Zone Management Act and all state agency programs and activities have been certified by the Land Conservation and Development Commission to be in conformance with the Coastal Zone Management Act. Local governments will, over the next few years, be revising their plans to comply with recent administrative rule revisions related to Goals 4 and 12 in the former instance increasing protection of forest lands and resources from conflicting uses and inappropriate rural development.

A section of the Coastal Zone Management Act requires that "Each federal agency conducting or supporting activities directly affecting the coastal zone shall conduct or support those activities in a manner which is, to the maximum extent practicable, consistent with approved state management programs" [Subsection 308(c)(1)]. The term "to the maximum extent practicable" means that federal agency's activities must be consistent with mandatory, enforceable, federally-approved state coastal zone policies whenever the agency has discretion under federal law to abide by state policies. The Coastal Zone Management Act does not, however, impose a higher duty on federal agencies than a state requires of its own agencies. The Oregon Coastal management Program mandatory enforceable policies consist of the statewide planning goals, acknowledged city and county comprehensive plans and land use regulations, and the statutory authorities and regulations of state agencies listed in the Oregon Coastal Management Program. Although federal lands are excluded from the boundaries of the coastal zone, the "directly affecting" provision requires federal agencies to examine their activities for offsite effects. An effect may be either a primary, secondary, or cumulative effect on the coastal zone.

## Local Government

The Oregon statewide planning program attached substantial importance to the coordination of federal plans with acknowledged local comprehensive plans. To the extent that BLM actions and programs are consistent with acknowledged county and city comprehensive plans and land use regulations, they can also be considered consistent with statewide planning goals. Local plans do not, however, address protection of Goal 5 values from the effects of forest management, as state law prohibits local governments from regulating forest practices. The comprehensive plan for Klamath County could be affected by the BLM's Klamath Falls Resource Area Resource Management Plan.

The District has contributed data for development of county comprehensive plans, followed the development of those plans through the years and consulted on issues of mutual interest. Based on knowledge gained through this involvement, the district planning staff believes that the Proposed Resource Management Plan is consistent with the comprehensive plans and land use regulations cited above.

In May 1994, the Klamath County Commissioners adopted the Klamath County Land and Water Management Plan. This plan outlines the County Commissioners position on local custom and culture. It also reiterates the coordination and consultation requirements of federal agencies. This Resource Management Plan is consistent with that portion of the Land and Water Management Plan. Where the County Plan is inconsistent with Federal rules, statutes, or management guidelines there may be inconsistencies. Should there be inconsistencies, federal law or policy will be followed.

**Table X-1. Consistency of the Proposed Resource Management Plan with the Forestry Program for Oregon.**

Forestry Program for Oregon Objective	Consistency of the Proposed Resource Management Plan
<p><b>1. Forest Land Use.</b> Preserve the forest land base of Oregon: Stabilize the present commercial forest land base. Manage habitat based on sound research data and the recognition that forests are dynamic and most forest uses are compatible over time.</p>	<p>Preserves most of the forest land administered by BLM, while allowing for some conversion of forest to accommodate expansion of transportation, power and communication facilities. Also allows for exchange and/or sale of some forest lands, which could lead to their conversion to nonforest uses if local land-use plans permit. Land that would be managed for commercial forest products totals 32,329 acres, less than the 60,465 acres currently allocated to commercial forest production. The allocation of additional land to uses other than timber production is based on current research data.</p>
<p><b>2. Forest Practices.</b> Assure practical forest practices that conserve and protect soil productivity and air and water quality: Promote forest practices that maintain Oregon's forest values, including forest tree species, fish and wildlife, soil productivity, and air and water quality. The Forest Practices Act and rules are one vehicle for accomplishing this.</p>	<p>Provides for the use of practical forest practices that meet this goal and meet or exceed the requirements of the Oregon Forest Practices Act and rules of the Oregon Smoke Management Plan, with one possible exception:</p> <p>(1) The requirement for smoke management clearance prior to burning slash and need for completion of burning before replanting, may cause delay in reforestation beyond the one year required by the Act.</p>

- |   |   |
|---|---|
| <p>3. <b>Timber Growth and Harvest.</b> Promote the maximum level of sustainable timber growth and harvest on all forest lands available for timber production, consistent with applicable laws and regulations and taking into consideration landowner objectives.</p>   | <p>Provides for the use of intensive forest management practices that are professionally and environmentally sound, to promote timber growth and harvest on all forest lands allocated as available for such intensive management, consistent with the Plan's goals and objectives.</p> |
| <p>4. <b>Recreation, Fish and Wildlife, Grazing and Other Forest Uses.</b> Encourage appropriate opportunities for other forest uses, such as fish and wildlife habitat, grazing, recreation and scenic values on all forest lands, consistent with landowner objectives: A full range of recreation opportunities is encouraged. Where needed to reduce harassment and/or over harvest of wildlife, road closure programs are supported.</p> | <p>Provides opportunities for other forest uses, consistent with the plan's goals and objectives. Road closures to protect wildlife habitat and other values are emphasized.</p>  |

**Table X-1. Consistency of the Proposed Resource Management Plan with the Forestry Program for Oregon (continued).**

Forestry Program for Oregon Objective	Consistency of the Proposed Resource Management Plan
<p><b>5. Forest Protection.</b> Devise and use environmentally sound and economically efficient strategies to protect Oregon's forests from wildfire, insects, disease and other damaging agents:</p> <p>Use integrated pest management.</p> <p>Minimize total cost plus loss resulting from wildfire. Employ cost-effective fire management policies that emphasize planned ignition fires over natural ignition fires and that consider impacts to the state's forest fire protection program.</p>	<p>Economically efficient protection strategies would be employed, and integrated pest management would be used.</p> <p>Minimizing total cost plus loss from wildfire would be integral.</p> <p>Planned-ignition prescribed fires would be emphasized over natural-ignition prescribed fires, but the latter could be used to achieve resource and fire management objectives.</p> <p>Cooperation with other fire suppression agencies, including state and local agencies, would help assure cost-effective fire protection and suppression by all parties.</p>

**Table X-2. Consistency of the Proposed Resource Management Plan with State of Oregon Wildlife Plans.**

State Plan/Statute	Objective	Consistency of the Proposed Resource Management Plan
Oregon Statutory Wildlife Policy, Revised Statute 496.012	<p>Maintain all species of wildlife at optimum levels and prevent the serious depletions of any Indigenous species.</p> <p>Develop and manage the lands and waters of the State in a manner that will enhance the production and public enjoyment of wildlife.</p> <p>Develop and maintain public access to the lands and waters of the State and the wildlife resources thereon.</p> <p>Regulate wildlife populations and public enjoyment of wildlife in a manner that is compatible with primary uses of the lands and waters of the State and provide optimum public recreational benefits.</p>	<p>May maintain some populations at less than optimum (see later discussion of big game management objectives and Effects on Wildlife.)</p> <p>Public access would be limited by access management.</p>

*Appendix X - Consistency with Other Agency Plans and Programs*

State Plan/Statute	Objective	Consistency of the Proposed Resource Management Plan
Oregon Threatened and Endangered Species Act	Protect and conserve wildlife species that are determined to be threatened or endangered.	All State listed species found within the Klamath Falls Resource Area are also Federally listed under the Endangered Species Act. As such, these species will be protected under the requirements and provisions of the Act.
Oregon's Sensitive Species Rule	Help prevent species from qualifying for listing as threatened or endangered.	Species on Oregon's sensitive species list would be protected. Also see later discussions of wild fish policy and fish plans.
Nongame Wildlife Plan	Maintain populations of naturally occurring Oregon nongame wildlife at self sustaining levels within natural geographic ranges in a manner that provides for optimum recreational, scientific and cultural benefits and, where possible, is consistent with primary uses of lands and waters of the State.	See preceding discussions.



State Plan/Statute	Objective	Consistency of the Proposed Resource Management Plan
Big Game Population Management Objectives	Develop, restore and/or maintain big game (along with associated recreation, aesthetic and commercial opportunities and benefits) at the level identified in 1980 as the planning target level by game management unit. This is accomplished through hunting season regulation and management practices on public lands that tend to stabilize the cover-forage relationship in space and time, provide for a wildlife emphasis in management of sensitive wintering areas, and offer habitat improvement opportunities.	Forage on BLM-administered lands could decline slightly, but are expected to remain stable. Private lands are expected to continue providing adequate forage. Access management objectives (open road densities of 1.5 miles or less per section) would improve habitat for elk.
Wild Fish Policy	Protect and enhance wild stocks.	Would not change habitat conditions enough in the short-term to alter existing stocks. In the long-term, would protect streams sufficiently to protect wild stocks and provide sufficient stream habitat protection to contribute to their enhancement.
Trout Plans	Maintain and enhance production.	Similar to wild stocks. See preceding.

*Appendix X - Consistency with Other Agency Plans and Programs*

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State Plan/Statute	Objective	Consistency of the Proposed Resource Management Plan
Basin Fish Management Plans	Establish compatible objectives for management of all fish stocks in each Basin.	Similar to wild stocks. See preceding.
Oregon Forest Practices Act Rules	Establish minimum standards which encourage and enhance the growing and harvesting of trees while considering and protecting other environmental resources such as air, water, soil and wildlife.	See Item 2, Table X-1 in this Appendix.

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# Relationship of Proposed Resource Management Plan to Statewide Planning Goals.

## Statewide Goal Number 1: Citizen Involvement

**Description** - To develop a citizen involvement program that ensures the opportunity for citizens to be involved in all phases of the planning process. Federal and other agencies shall coordinate their planning efforts with the affected government bodies and make use of existing local citizen involvement programs established by cities and counties.

**Consistency of Proposed Resource Management Plan** - The BLM's land use planning process provides for public input at various stages. Public input was specifically requested in developing issues, planning criteria, and the Proposed Resource Management Plan. Coordination with affected government bodies, including the Governor's forest planning team, has been ongoing and will continue. The BLM has used County planning departments to provide linkage to local citizen involvement programs.

## Statewide Goal Number 2: Land Use Planning

**Description** - To establish a land use process and policy framework as a basis for all decisions related to use of land and to assure an adequate factual base for such decisions and actions.

**Consistency of Proposed Resource Management Plan** - The Proposed Resource Management Plan has been developed in accordance with the land use planning process authorized by the Federal Land Policy and Management Act of 1976, which provides a policy framework for all decisions and actions. The process includes issue identification, inventories, and evaluation of alternative choices of action. Intergovernmental coordination in the planning process is discussed in Chapter 5 of the resource management plan/environmental impact statement.

## Statewide Goal Number 3: Agricultural Lands

**Description** - To preserve and maintain existing commercial agricultural lands for farm use, consistent with existing and future needs for agricultural products, forest and open space.

**Consistency of Proposed Resource Management Plan** - with some limitations the Proposed Resource Management Plan does not exclude BLM-administered grazing land from grazing use or affect the use of other lands for agriculture use. Changes in grazing use would be done through the allotment management planning process and range land monitoring studies and subsequent evaluations.

## Statewide Goal Number 4: Forest Lands

**Description** - To conserve forest lands by maintaining the forest land base and to protect the state's forest economy by making possible economically efficient forest practices that assure the continuous growing and harvesting of forest tree species as the leading use on forest land consistent with the sound management of soil, air, water, and fish and wildlife resources and provision for recreational opportunities and agriculture.

**Consistency of Proposed Resource Management Plan** - The BLM-administered lands in the planning area include forest land and woodlands. The Proposed Resource Management Plan would not lead to substantial conversion of those lands to nonforest uses. Conversion areas such as new forest roads and utility rights-of-way would be limited to the minimum width necessary for management and safety, and the latter limited to existing corridors where practical. Some existing roads would be returned to forest or woodland. The Proposed Resource

## **Appendix X - Consistency with Other Agency Plans and Programs**

Management Plan is consistent with the State's forest land protection policies, with one possible exception (See Forestry Program for Oregon Objective: Forest Protection in Table X-1 earlier in this appendix).

### **Statewide Goal Number 5: Open Spaces, Scenic and Historic Areas, and Natural Resources**

**Description** - To conserve open space and protect natural and scenic resources.

Programs shall be provided that will:

- ◆ insure open space;
- ◆ protect scenic and historic areas and natural resources for future generations; and
- ◆ promote healthy and visually attractive environments in harmony with the natural landscape character.

The location, quality and quantity of the following resources shall be inventoried:

- ◆ Land needed or desirable for open space;
- ◆ Mineral and aggregate resources;
- ◆ Energy sources;
- ◆ Fish and wildlife areas and habitats;
- ◆ Ecologically and scientifically significant natural areas, including desert areas;
- ◆ Outstanding scenic views and sites;
- ◆ Water areas, wetlands, watersheds and groundwater resources;
- ◆ Wilderness areas;
- ◆ Historic areas, sites, structures and objects;
- ◆ Cultural areas;
- ◆ Potential and approved Oregon recreation trails;
- ◆ Potential and approved Federal wild and scenic waterways and state scenic waterways.

Where no conflicting uses for such resources have been identified, such resources shall be managed so as to preserve their original character. Where conflicting uses have been identified, the economic, social, environmental, and energy consequences of the conflicting uses shall be determined and programs developed to achieve the goal.

Based on the analyses of economic, social, environmental and energy consequences to Goal 5 resources listed above, conflicting uses of (BLM-administered) lands and resources may be resolved by selection of three management options: (1) protect the resource site; (2) allow conflicting uses fully; or (3) limit conflicting uses. This is achieved by designating with certainty what uses and activities are allowed fully, what uses and activities are not allowed at all, and which uses are allowed conditionally, and what specific standards or limitations are placed on the permitted and conditional uses and activities for each resource site.

**Consistency of Proposed Resource Management Plan** - Natural, historic and visual resources were considered in the development of the Proposed Resource Management Plan. Availability of mineral, aggregate and energy sources would continue, but be somewhat limited. Timber and ecosystem management actions would impact natural and visual resources.

Adverse impacts to visual resources, wildlife habitat, potential wild and scenic rivers and state waterways, and unique natural areas would be slight. Water areas, wetlands and watersheds would be protected. See Chapter 4 for discussions. Also see Forestry Program for Oregon Objective: Forest Practices in Table X-1 earlier in this appendix for discussion of consistency with relevant sections of the Forest Practices Act and Rules.

The Proposed Resource Management Plan attempts to balance conflicting uses in light of their consequences. Conflicting resource uses are most often resolved by protecting the Goal 5 resource site or severely limiting conflicting uses to meet environmental goals.

Even without any tradeoffs to enhance or maintain the existing programs, tradeoffs would be necessary between Goal 5 resource values. For example, mineral and aggregate resource or energy source access and development frequently conflict with all other Goal 5 values.

## **Statewide Goal Number 6: Air, Water, and Land Resources Quality**

**Description** - To maintain and improve the quality of the air, water and land resources of the state.

**Consistency of Proposed Resource Management Plan** - The federal and state water quality standards would be met and water quality would be maintained and/or improved. See Effects on Water Resources, for discussion. Burning would have a potential effect on air quality, but without prescribed fire, the effects of wildfires on air quality would increase. The Proposed RMP would comply with the Oregon Smoke Management Plan and the State Implementation Plan. See Effects on Air Quality, for discussion. Also see Forestry Program for Oregon Objective: Forest Practices in Table X-1 earlier in this appendix for discussion of consistency with relevant sections of the Forest Practices Act and Rules.

## **Statewide Goal Number 7: Areas Subject to Natural Disasters and Hazards**

**Description** - To protect life and property from natural disasters and hazards.

**Consistency of Proposed Resource Management Plan** - Natural hazard areas, particularly floodplains and areas with highly erosive soils have been identified. The Proposed Resource Management Plan provides for appropriate management of natural hazard areas. The BLM-authorized developments within natural hazard areas would be minimal, with project construction engineering reflecting site-specific conditions and requirements.

## **Statewide Goal Number 8: Recreational Needs**

**Description** - To satisfy the recreational needs of the citizens of the State and visitors and, where appropriate, to provide for the setting of necessary recreational facilities including destination resorts. Federal agency recreation plans shall be coordinated with local and regional recreational needs and plans.

**Consistency of Proposed Resource Management Plan** - The BLM actively coordinates its recreation and land use planning efforts with those of other agencies to establish integrated management objectives on a regional basis. Opportunities would be provided to meet recreation demand (identified in Oregon's Statewide Comprehensive Outdoor Recreation Plan). Projected demand for activities on BLM administered land would be met under the Proposed Resource Management Plan.

See Effects on Recreation, for further discussion. There has been no specific interest in development of destination resort sites on BLM administered lands.

## **Statewide Goal Number 9: Economic Development**

**Description** - To provide adequate opportunities throughout the state for a variety of economic activities vital to the health, welfare, and prosperity of Oregon's citizens.

## ***Appendix X - Consistency with Other Agency Plans and Programs***

**Consistency of Proposed Resource Management Plan** - The Proposed Resource Management Plan would support reduced levels of BLM resource dependent employment and payments to counties, due to diminished timber production. Changes in grazing use in the Proposed Resource Management Plan are minimal with minor effects on employment. Changes, if proposed, would be accomplished through the allotment planning process and the evaluation of range land monitoring studies. Employment in rural areas would be most affected. See Effects on Socioeconomic Conditions, for further discussion.

### **Statewide Goal Number 10: Housing - not considered applicable in the Klamath Falls Resource Area.**

### **Statewide Goal Number 11: Public Facilities and Services**

**Description** - To plan and develop a timely, orderly, and efficient arrangement of public facilities and services to serve as a framework for urban and rural development.

**Consistency of Proposed Resource Management Plan** - The BLM-administered lands may be made available for development of public facilities or services by other parties, if the action would be permitted under the local government comprehensive plan and land use regulations, and relevant State setting requirements.

### **Statewide Goal Number 12: Transportation**

**Description** - To provide and encourage a safe, convenient and economical transportation system.

**Consistency of Proposed Resource Management Plan** - The Proposed Resource Management Plan provides for accommodation of identified transportation needs, particularly for transportation of timber where not in conflict with Endangered Species Act requirements, but setting a major new transportation route (for example, State highway) would require a plan amendment. Major utility corridors were considered and would be designated. The Proposed Resource Management Plan supports State policy objectives to restrict use of BLM roads for access to nonresource development that would be inconsistent with State planning goals.

### **Statewide Goal Number 13: Energy Conservation**

**Description** - To conserve energy.

**Consistency of Proposed Resource Management Plan** - Conservation and efficient use of energy sources are objectives in all BLM activities. The Proposed Resource Management Plan finds one river suitable for inclusion in the National Wild and Scenic River System, which would restrict the possibility of development of its hydroelectric potential. There is currently a pending development proposal for that river, which would be affected if that river were designated under the Wild and Scenic Rivers Act. Currently, there is an environmental impact statement being developed for one alternative energy project, the Lorella project, that partially falls on BLM-administered lands in the resource area. Other alternative energy projects proposals would be evaluated on a site-specific basis. Firewood sales would be permitted, but firewood availability would be limited by allocation of substantial acreage to limited timber harvest.

### **Statewide Goal Number 14: Urbanization - not considered applicable in the Klamath Falls Resource Area.**



**Statewide Goal Number 15: Willamette Greenway - not considered applicable in the Klamath Falls Resource Area.**

**Statewide Goal Number 16: Estuarine Resources - not considered applicable in the Klamath Falls Resource Area.**

**Statewide Goal Number 17: Coastal Shorelands - not considered applicable in the Klamath Falls Resource Area.**

**Statewide Goal Number 18: Beaches and Dunes - not considered applicable in the Klamath Falls Resource Area.**

**Statewide Goal Number 19: Ocean Resources - not considered applicable in the Klamath Falls Resource Area.**

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